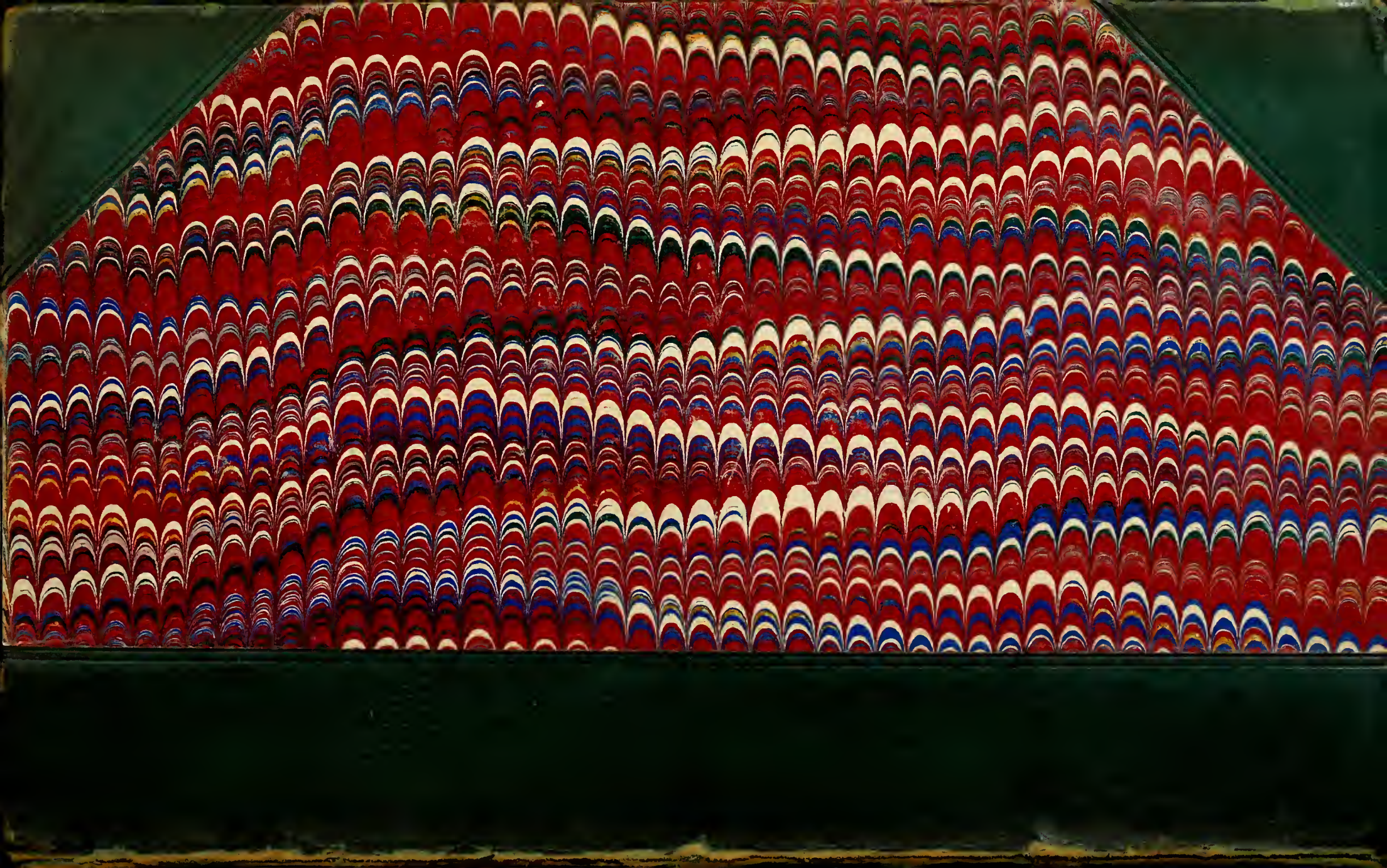

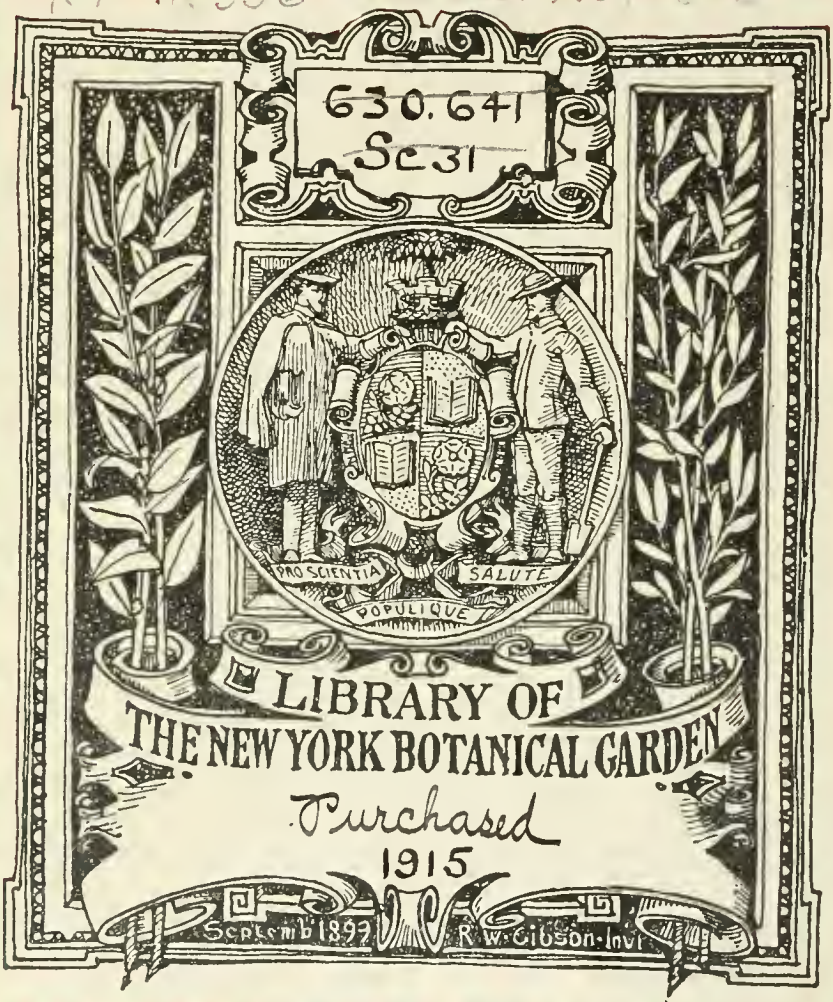

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HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

WITH

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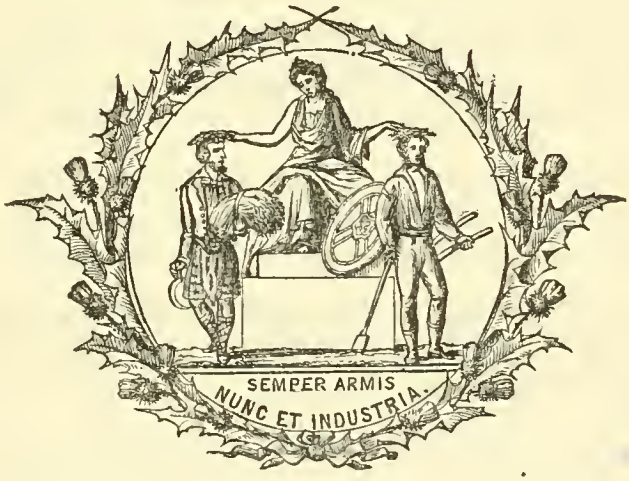
PUBLISHED ANNUALLY.



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TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

ON THE AGRICULTURE OF THE COUNTY OF FIFE.

By James Macdonald, Special Reporter for the *Scotsman*, Aberdeen.

[*Premium—Thirty Sovereigns.*]

General and Introductory.

The county of Fife has pre-eminent claims to the dignified title of the "Kingdom," with which it is frequently honoured. It is more largely surrounded by water than any other county in the mainland of Scotland; and few counties in the United Kingdom are more self-supporting—so extensive and so valuable are its manufactures, so varied and so rich are the treasures of its rocks and the production of its soil.

Fifeshire is attached to the mainland of Scotland only by a narrow band on the western side, where it joins the counties of Kinross, Clackmannan, and Perth. Its other three sides are bathed in the waters of the ocean—the south by the Firth of Forth, the north by the Firth of Tay, and the east by the German Ocean. It lies between 56° and 56° 28′ north latitude, the "East Neuk" being in 2° 35′, and the most westerly point in 3° 43′ west longitude. From east to west it averages about 36 miles, and right down the centre from north to south it measures about 14 miles. It has been ascertained by the Ordnance Survey that the area of the county is 513 square miles, or 328,427 acres. About four-fifths of the whole area is under regular cultivation, the greater portion of the remainder being under wood. The county is divided into 64 parishes, a number of which are by no means large. The population in 1871 was 160,735, and the number of inhabited houses 27,056. There are in all 10,410 owners of land in the county, 8638 having less than one acre,

or 1517 acres divided amongst them; while 1772 have possessions exceeding one acre in extent, or in all 302,846 acres. In 1872–3, when the return of owners of land in Scotland was taken up by the Government, the gross annual value of the possessions of 1772 large landed proprietors was L.741,379, 10s.; and those of the 8638 small land owners, L.164,197, 17s. The gross annual value of the whole county, exclusive of burghs and railways, according to the Valuation Roll for 1874–5, is L.698,470, 13s. 10d. The total valuation of burghs is L.208,002, 8s. 4d., and of railways, L.49,957—grand total, L.956,430, 2s. 2d.

The Board of Trade returns for the present year (1875) state the total number of acres under all kinds of crops, bare fallow and grass, at 243,669 acres, of which 16,748 were under wheat, 30,037 barley or bere, 37,646 oats, 1304 rye, 2483 beans, and 109 peas, being a total under grain crops of 88,327 acres. The average under green crop was 47,460 acres—28,514 under turnips, 17,746 potatoes, 34 mangold, 23 carrots, 88 cabbage, kohl rabbi, and rape, and 1055 vetches and other green crop. Of permanent pasture there is 50,261 acres, and of grasses under rotation, 56,430 acres, and of bare fallow, or uncropped arable land there is 1189 acres.

Though almost every corner of the county is the scene of great enterprise and no little activity, it cannot be said that the general aspect of Fifeshire is strikingly commercial. On the contrary, it has the appearance of being a quiet, retired rural spot, where the aesthetic has never been wholly lost sight of. Few counties in Scotland, if indeed any, can boast of a larger number of baronial residences and gentlemen's seats than are to be found studding and beautifying the undulating landscape of Fifeshire. The number of landed proprietors is larger than in any other county of similar size in Scotland, and the fact that these worthy gentlemen, with a few exceptions, have all along been in the habit of residing on their desirable possessions in Fife, explains the preservation of the county from the modernising hand of trade and commerce. Not that they have hampered the spread of industry and enterprise,—they have encouraged and aided the development of every healthy industry in a manner that reflects upon them unbounded credit,—but they have with equal care and rigour preserved the amenities of their native county. Even in the greatest mining centres where coal-pits are seen to the right and to the left, the scenery is very fine, being beautified by numerous clumps of trees; while in the purely agricultural districts, the carefully cultivated fields are tastefully fringed by thriving belts of wood. The surface undulates considerably, yet there are no high hills, the point of greatest eminence—West Lomond—being only 1713 feet above the level of the sea. The Largo Law hill, situated in the parish of Largo, on the south coast, rises to a height

of 1020 feet, and commands a magnificent view of the Firth of Forth and the city of Edinburgh. The Lomonds lie at the north-west of the county, and impart to the scenery around them an aspect which contrasts strikingly with the landscape along the seaboard. Seated on the highest eminence of these hills on a clear day, and provided with a powerful binocular field-glass, one can command a most exquisite view. At our feet lies the historical Kingdom of Fife spread out like a magnificent carpet, while away in the distance the prospect is grand in the extreme. Southwards we see the low winding ranges of the Pentlands and the Lammermuirs, and the richly cultivated Lothians; to the west lies, dimly shrouded, the lofty Ben Lomond; to the north, the rugged range of the Grampians; and, turning to the east, the prospect softens down to the blue haze of the German Ocean. The smaller objects of attraction in this wide range are far too many to be enumerated, but, in a word, it may be said that the prospect is one of the finest to be had anywhere in Scotland; and what country can boast of grander prospect than the

"Land of brown heath and shaggy wood"?

There are no very large plantations, the wood being pleasantly strewed over the whole county in thriving clumps, diversifying the scenery and lending a lustre to the charm of the landscape. The county has no less than 85 miles of a coast line, considerable portions of which are bold and rocky, and indented here and there by miniature bays. Between Wemyss and the "East Neuk" a pretty large stretch is low and sandy, and parts of it strewed with massive pieces of rock; while on the east it is irregular and very rocky, and on the north-east plain and sandy.

There are only two rivers worthy the name—the Eden, which rises in the parish of Arngask, and after a quiet winding course of about 24 miles, empties itself into St Andrew's Bay; and the Leven, which has a course of only 12 miles, rising in Loch Leven, in the parish of Portmoak, and falling into the Firth of Forth at Leven. The next largest stream is the Orr—a slow muddy stream winding from the Saline hills easterly to Dysart. There are several very small streamlets throughout the county, the most of which are tributaries of the Eden, the Leven, or the Orr. The Eden and the Leven at one time were valuable salmon rivers, but now mill-dams and manufactories disturb the fish and make the rivers almost worthless in this respect. The trout-fishing, however, is excellent on nearly all the waters, as also in several of the lochs. There is a number of lochs in the county, but the majority of them are very small, the principal ones being Lindores —about four miles in circumference; Lochgelly, about three miles in circumference; and Kilconquhar, about two miles in

circumference. Moors are neither numerous nor large, and game very scarce, hares and partridges being the predominating species. The majority of the landlords preserve their shootings; but it is seldom that game grievances disturb the political atmosphere of Fife. In the higher parts, adjoining Kinross, there is a considerable quantity of peat-moss, and deposits of moss are met with here and there throughout the county.

One important feature of Fife is the very large number of towns and villages that are scattered over the county. There are no fewer than fourteen royal burghs, and a whole host of villages, chiefly along the coast. Cupar is the county town. It is situated on the river Eden, has a population of 5105, and is a cleanly kept busy little town of great antiquity. By far the largest town is Dunfermline, situated at the south-west end of the county. During the past two centuries it has risen from an unimportant rural village to one of the principal manufacturing towns in Scotland. It has a population of 14,963, is yearly extending in magnitude, and may be called the commercial capital of the county. St Andrews, once the ecclesiastical capital of Scotland, is a city of very great interest to the antiquary, because of the peculiarly eventful character of its ancient history. It was constituted a royal burgh by David I. in 1140, and was once a most populous town, but since the Reformation it has dwindled away considerably, and now it can number only 6316 inhabitants. The University of St Andrews was founded in 1411 by Bishop Wardlaw, and is thus the oldest university in Scotland. The "Lang Toon" (Kirkcaldy), famous for its manufactories and as the birthplace of Adam Smith, the talented author of the "Wealth of Nations," has an industrious population of 12,422; while Dysart, situated on the coast two miles north-east from Kirkcaldy, numbers 8919 persons. Burntisland, a rising watering-place, stands on the coast almost immediately opposite Edinburgh, and has a population of 3265. It is surrounded by scenery of great grandeur, is held in high repute as a watering-place, and during the summer months, when it is resorted to by hundreds of the inhabitants of Edinburgh and other towns, is the scene of no little life. The village of Lower Largo is famous as having been the birthplace of Alexander Selkirk, the prototype of "Robinson Crusoe," while Anstruther-Easter, a royal burgh with a population of 1,289, ranks amongst its sons with pardonable pride the celebrated Dr Chalmers. The ancient history of the county of Fife is of much more than ordinary interest on account of its being so closely connected with the life and history of the kings of Scotland. Anything merely historical is beyond the range of this report, but a few sentences may be given. At one time the entire district, comprising Fife, Clackmannan, Kinross, the eastern part of Strathearn, and the country west of the

Tay, as far as the river Braan, was inhabited by the Horestii, a Celtic race, and was designated Ross, meaning a peninsula. The peninsula was partly divided about 450 years ago, but it was not till 1685 that the county of Fife was reduced to its present size. At the time of the Roman invasion the Celts were driven from their peninsular domain, and after the Romans came the Picts, who united with the Scots about the middle of the ninth century. In 881, and in several subsequent years, the Danes invaded the county and troubled the inhabitants dreadfully. Down till 1424 the Thanes of Macduff held sway over the greater portion of ancient Fife, but on the execution of their last chief, Murdoc, their estates were confiscated to the Crown, and Falkland Palace, the residence of the Thanes, became the property and abode of the kings of Scotland. Since then the social atmosphere of Fife has been comparatively clear and tranquil, while enterprise and enlightenment have all along been the order of the day. It is worthy of mention that Malcolm Canmore, David I., Malcolm the Maiden, Alexander III., Robert Bruce, his Queen Elizabeth and nephew Randolph, Annabella, Queen of Robert III., and Robert Duke of Albany were buried in the Abbey of Dunfermline, an antiquated ruin, founded by Malcolm III. about 1070. In digging for the foundation of the new parish church in 1818 the tomb of Robert Bruce was discovered, and his skeleton found wrapt in lead.

The county sends one member to Parliament, the present representative being Sir Robert Anstruther, Bart. of Balcaskie; while Cupar, St Andrews, East and West Anstruther, Pittenweem, Kilrenny, and Crail have one member—Mr Edward Ellice; and Kirkcaldy, Dysart, Kinghorn, and Burntisland another—Sir George Campbell. Dunfermline and Inverkeithing are conjoined with the Stirling District of Burghs; and by the Reform Act of 1868 the Universities of St Andrews and Edinburgh were combined into one constituency, their present representative being Dr Lyon Playfair. The county is divided into two districts, an eastern and western, for judicial purposes, and each division is under the jurisdiction of a sheriff-substitute. For civil purposes it is divided into four districts, viz., Cupar, St Andrews, Kirkcaldy, and Dunfermline.

The railway system now extends to nearly every district of the county, while the ferry-boats at Burntisland and Tayport bring the county into close connection with the principal centres of trade and commerce in Scotland. The expenditure on railways within the county during the past ten or twelve years has been very great, and if once the branch—now in process of construction—from Dunfermline to Inverkeithing and Queensferry were opened, the system will be almost complete. In the matter of roads also the county is well accommodated.

A monthly cattle market is held at Cupar, while similar fairs take place at stated times at other parts of the county. During the winter and spring grain markets are held weekly at all the principal agricultural centres. The proximity and easy access, however, to the Edinburgh markets make farmers less dependent on the local fairs for the sale of their stock and grain than they would otherwise be.

Population.

The following table shows the population of the county at various stages during the past seventy-four years:—

1801, . . .	93,743	1841, . . .	140,140
1811, . . .	101,272	1861, . . .	154,770
1821, . . .	114,556	1871, . . .	160,735
1831, . . .	128,839		

The increase since 1801, it will thus be seen, is 66,992; and it is worthy of notice that the increase has been gradual and constant. The number of inhabited houses in 1851 was 24,610, now it is 27,056, and the number of separate families 38,038. The present population is equal to about 313 to the square mile, or little more than 2 to each acre; or to put it exactly, 53 to every 26 acres. The average number of persons to each house is very close on 6. The topographical nomenclature—the touchstone of the ethnographer—of the county of Fife is sufficient to demonstrate the fact that the aboriginal inhabitants were Celts. The number of farms and places designated by Celtic names is very large, and it is peculiarly interesting to note the striking similarity that exists between the local names of Fife and those of several of the northern counties of Scotland, a fact that speaks of a similarity or kinship between the original inhabitants of Fife and those of the north. The Horestii—the name given to the tribe of Celts that originally inhabited Fife, or rather the peninsula of Ross—were not characterised by industry or enterprise, and like their kinsmen in the north must have had often to be satisfied with a scanty meal; for in those days Fife is described as having been nothing else than an immense forest full of swamps and morasses and inhabited by wild beasts. They had no towns in their possession, but occupied hill forts, the remains of many of which are still to be seen at several spots throughout the county. The Horestii were almost wholly annihilated by the Romans, who in turn were succeeded by the Picts, that ancient Celtic race, regarding whose origin and early history so much has been written and spoken. Fifeshire formed part of the southern boundary line of the Pictish territory, the English having then possessed the Lothians and the independent Britons the kingdom of Cumbria, while the Scots, another Celtic race

that inhabited ancient Scotland, or in other words the "Emerald Isle," occupied the western coast from the Firth of Clyde to Rossshire. Towards the middle of the ninth century the two Celtic races—the Picts and the Scots—united, and lived peaceably until disturbed by the ambitious Danes, who invaded Fife in 881. From that time down till 1424, when the extensive lands of the Thanes of Macduff (who possessed the greater portion of Fife) were, on the execution of Murdoc the last chief of the Thanes, confiscated to the Crown, the county frequently sustained considerable damage at the hands of invaders. In the days of James V., who resided at Falkland Palace, the social condition of Fife, like the most of Scotland, was not of the brightest or the happiest description. But the reign of that unfortunate monarch may be noted as one of the turning points, a new point of departure, in the social history of Fife, for ever after the county has been found in the van of progress. The advance in the social and intellectual scale during the present century has been most marvellous; and Mr Westwood, in his "Parochial Directory for 1862," says that "perhaps nothing gives that progress so much prominence as the magnitude attained by the newspaper press connected with the county. Previous to 1822 there was no newspaper published in Fife, and the practice was to advertise county and other public meetings in an Edinburgh newspaper, and a few hundreds would probably cover the sum total of every newspaper that found an entrance into the county. At present (1862) Fife can boast of ten weekly newspapers and advertising sheets, besides three with a fortnightly issue, having a total circulation of 25,000; nor is this all, for the circulation of Edinburgh and other newspapers not connected with the county is at present ten times more than it was when no native broadsheet existed. All this, without taking into account the immense circulation of periodicals and books of every shape and size, which forty years ago had no existence, exhibits an intellectual progress penetrating to all classes of our society, and exerts an educational influence unequalled in any country or in any age of the world." Even since 1862 there has been considerable improvement in the social condition of the county. The educational machinery, always abreast of the times, has been improved and extended a good deal of late, and is now second to that in no other county in Scotland; while the position and influence of the newspaper press has been greatly strengthened. The mining and manufacturing interests being so extensive, the number of commercial men in the county is necessarily large, and these as a class are sharp, shrewd, intelligent, and well to do; while the farmers, generally speaking, are independent, industrious, enterprising, comfortably-conditioned men, several of them wealthy. The working population have superior advantages in the way of

house accommodation, and are well-behaved, economical, industrious, and trustworthy. Miners, an exclusive class of men, not always credited with peaceful social habits, form an important class in the county. Barring a little roaring now and again, however, about strikes and trades unions, Fifeshire has little to complain of in this respect. There is less stir and bustle now, however, in the mining centres than some two or three years ago, when the revolutionary movements in the mining world were at their height. On a summer's Saturday afternoon some two years ago it was almost an absolute impossibility for ordinary persons to obtain a cab or a carriage of any description in Dunfermline for an hour's drive, the miners, rampant with their ten shillings a day, having them all engaged for a drive "into the country."

The dialect of the county is varied. The ordinary people speak mixed Scotch, while in the higher circles English only is heard. Throughout the county generally several antiquated social habits still obtain. The farmers, for instance, in speaking of the produce of their farms, calculate by the Scotch acre instead of by the imperial acre as in most other counties, while the ancient system of regulating rent by the fiars is still adhered to in many cases. Sporting is indulged in only to a limited extent. There is one pack of foxhounds and one pack of harriers, and no fewer than forty-one curling clubs in the county; but the favourite outdoor sport seems to be the "royal game of golf." The links at several of the towns and villages along the coast are specially adapted for golf, and during the summer they are all taken full advantage of. The county can also boast of a very creditable body of mounted volunteers, as well as a strong regiment of rifle volunteers.

Climate.

The climate of the county is modified by proximity to the sea. It is not so variable, not so cold in winter nor so hot in summer as in larger continental areas of country. The climate is mild, and the air humid and healthy, while the rainfall is not by any means heavy. In the darker ages, when the extensive valleys lay in spongy swamps, foul mists continually shrouded the county, keeping it constantly in a damp, disagreeable, unhealthy state. These mists are peculiarly trying to delicate constitutions, while they foster and encourage disease of various kinds, and man and beast often suffered very considerably from their prevalence. As the ignorant feudalisms and rude barbarities of ancient Fife have been swept away by the current of modern culture and the spread of civilisation, these dingy mists have disappeared before the enterprising agriculturist. Thorough drainage and improved cultivation have completely revolutionised the county of Fife—have changed it from an unhealthy swampy waste, a nursery for wild

beasts, into a rich agricultural county. Occasionally several of the valleys are still visited by floating mists and "hoar" frosts, and in the month of July grain and potatoes are heavily damaged thereby, while in winter turnips in low ground often fall victims to these hoar frosts. But the loss sustained in this way is trifling compared with what was experienced some fifty or sixty years ago. Westerly winds prevail, but sometimes in spring and autumn biting east winds sweep along the east coast, especially in spring, doing slight damage to the young crops. The numerous belts and clumps of wood, however, that stud the fields break and soften the current of the wind, and lessen immensely the damaging effect on the crops. The climate varies a little in some parts of the county, being a little more rigorous in the higher lying parts than in the valleys and on the coast. Severe passing storms of wind and rain sometimes sweep along the coast from the German Ocean, but it is seldom that snow lies to any great depth or for any length of time on the lands near the sea. The higher lands and hills in the interior are often clothed in a snowy mantle in November, and coated to the depth of several inches now and again during the winter. On the whole, the winters are comparatively open, and agricultural operations are rarely suspended in consequence of the weather. Rough weather seldom prevails in spring, while the harvests, or rather autumns, are invariably favourable. Vegetation commences early and continues far through the season, The *flora* of the county is peculiarly rich, and interesting to the botanist. The Thalami-floral orders, the Crowfoot (*Ranunculaceæ*) family especially, are extremely well represented, at least one species of the genus *Thalictrum* being found in Fife and in no other county in Scotland. The rainfall during the year generally averages about 21½ inches, or 486,265 gallons to the acre. The following table shows the rainfall during each of the twelve months of 1873 and 1874 at the Fife and Kinross District Lunatic Asylum, near Cupar:—

	1873.	1874.		1873.	1874.
January, .	2·350	2·550	August, .	1·420	3·610
February, .	0·690	0·980	September, .	2·570	2·300
March, .	1·280	2·160	October, .	3·021	0·220
April, .	0·170	0·750	November, .	2·600	3·040
May, .	2·180	1·530	December, .	1·650	1·840
June, .	0·650	0·590			
July, .	2·910	2·180	Total,	21·491	21·750

Geology—Soils.

That well-defined valuable group, the Carboniferous system, lying in the geological table of the earth's crust, between the Old and New Red Sandstone, is the formation that abounds in Fifeshire as in extensive portions of the Lothians and the south-

west of Scotland. The system, however, is not by any means intact in the county. In almost all the Dunfermline and a considerable portion of the Kirkcaldy district it abounds pretty exclusively. Here the coal formation is extensive and very rich, and affords a valuable contribution to the coal supply of our country, while it makes the west of Fife one of the busiest centres in the "Land o' Cakes." Ironstone is abundant in several parts of the county, and is extensively quarried at Oakley and other works in the Dunfermline district. Lead was at one time quarried out of the Lomond hills.

With the exception of a narrow band running from Dunfermline to Dunino, near St Andrews, the eastern and northern portions of the county are almost entirely destitute of coal. On the high lands in the parishes of Cameron, Ceres, Kettle, and Falkland, and along a ridge in the direction of Dunfermline, the carboniferous limestone exists in great quantities, and is worked extensively. The soil on the section of the county north of the valley of the Eden lies on those felspathic igneous traps that are so often connected with the Old Red Sandstone. This formation, however, does not exist to any great extent, being confined chiefly to the valley of the Eden, where the upper or yellow group abounds. Freestone of considerable value is quarried at various points. Dura Den—a romantic ravine in the neighbourhood of Cupar—is peculiarly rich in those fish fossils so characteristic of the Old Red, and has engaged the pen of many of our most talented geologists who have paid it a visit hammer in hand, eager to possess some of its fossilised treasures. With all this variety of rocks and formations throughout the county, the soil of the various districts necessarily differs considerably, the character of the soil being generally dependent upon the chemical condition of the rocks that underlie it. In a few hollows on the north-west alluvial accumulations form the soil, but with these exceptions the soil of the different districts corresponds pretty closely to the underlying rocks. Thus in the section of the county north of the Eden the soil is quick and fertile, the trap rocks which abound there being rich in those "inorganic substances which are essential to the healthy sustenance of plants." Nowhere north of the Eden is there great depth of soil, neither is it very strong, but it is kindly, very productive, and specially suited for the cultivation of grass. True to the characteristics of the trap districts, the scenery and surface north of the Eden presents great diversity—numerous irregular mounds and many waving valleys. The soil that overlies the Carboniferous system is generally composed of cold retentive clays and decomposed bituminous shales, and is seldom fertile or easily cultivated. This rule still holds good in several parts of Fife; but the advanced system of farming—the extensive

draining and the heavy manuring—of the past fifteen or twenty years, have immensely improved the natural properties of the soil, have changed much of it into fertile land. The Howe of Fife or Stratheden, comprising both sides of the Eden up as far as Cupar, has rich fertile soil, parts of it being exceedingly productive. South of the Eden the land rises gradually until it reaches, in the parish of Cameron, an elevation of upwards of 600 feet. On this high land the soil is cold and stiff and of a clayey character, with a mixture of lime. Around Ladybank the soil is very light and shingly, and presents signs of having been swept off its richest earthy coating by a current of water. The land on the rising ground in the parishes of Collessie, Monimail, Cults, and Kettle is considerably heavier and more valuable than in the valley of Ladybank. In the neighbourhood of the Lomonds the soil is light, but sharp and valuable for grass, while similar remarks apply to the high land of Auchtermuchty, Leslie, and Kinglassie. In the parishes of Beath, Auchterderran, and Ballingry, the land is principally cold and stiff; but several very excellent highly-cultivated farms are to be found in these parishes. A good deal of the land on the north side of Dunfermline is composed of clay of a strong retentive nature, while on the south the soil is chiefly thin loam, with a strong clayey subsoil. In the parishes of Saline, Torryburn, and Carnock the soil is mainly a mixture of clay and loam, and is generally very fertile. All along the coast the soil, though variable in composition, is rich and productive. The "Laich of Dunfermline" has a strong clayey soil, somewhat stiff to cultivate, but on the whole very fertile. The soil on the coast from Inverkeithing to Leven varies from light dry to strong clayey loam, rendered extremely fertile and friable by superior cultivation. About Largo the soil is deep rich loam, and produces magnificent crops of all kinds, while in Elie it is light but very fertile. Along the east coast the soil is deep and strong and very productive, consisting chiefly of clay and rich loam. Speaking generally, very little hindrance is afforded to tillage by rolling stones or upheavals of rock, but here and there all over the district, sloping down from the heights in the parish of Cameron to the Firth of Forth, beds of water-worn boulders are met with. These boulders, lying in beds or rows from north-west to south-east, belong to the metamorphic rocks, and were brought thither doubtlessly by floating icebergs during the glacial period. In the neighbourhood of St Andrews the soil is by no means heavy, while the section lying north-east of Leuchars village is sandy and very light, especially on the east coast, where a large tract of land known as Tent's Moor is wholly covered with sand, and almost useless for agricultural purposes. In Forgan and part of the parish of Ferry-Port-on-Craig, the soil, though light and

variable, is kindly and fertile. On the farm of Scotscraig there are a few fields of very superior land.

The Progress of the past Twenty-Five Years.

The total acreage reclaimed in Fifeshire since 1850 is very small, almost every suitable tract of land having been brought under the plough long before that time. The spirit of improvement dawned early on the county of Fife, and hence all the important reclamations date much further back than the range of this report. In dividing and squaring up fields during the past twenty-five years, many small patches and out-of-the-way corners that previously produced only rough pasture have been made into cultivated land, while around the base of hills on the borders of Kinross a few fields have been reclaimed partly from moss and partly from strong pasture land. Draining of course was the first operation in all those improvements, the stronger land being trenched to a considerable depth. But though the acreage is not greatly increased, the progress of the past twenty-five years has nevertheless been very great. Those who recollect the state of agriculture previous to 1850 can trace in the farms of the present day many wonderful improvements. In fact, though a few of the older farmers still retain many of the ancient customs,—customs that will in all probability die with themselves,—it may almost be said that an entire change in the system of farming has taken place in Fife during the past quarter of a century. The science and practice of agriculture have of late years been receiving considerable attention from a large section of the Fifeshire farmers, and in the increased productiveness of the soil the result is showing itself more and more strikingly every year. The expenditure for improvements since 1850—and it has been very large—must be noted mainly against draining, building, and fencing. Having been naturally very wet and swampy, and next to useless in its original state, the greater portion of the land was thoroughly drained early in the present century. Naturally, however, these drains, never perhaps of the first order, required mending after having done good service for perhaps a nineteen years' lease; and during the last twenty-five or thirty years, almost the whole of the county has been redrained.

A great deal has been done since 1850 in the way of improving the buildings in the county. The farmer's dwelling-houses have been immensely improved, while a very large number of as fine farm-steadings as are to be seen anywhere in Scotland have been erected. A very considerable amount of money has also been spent in the erection of labourers' cottages. Almost every farm of even moderate size in the county is now provided with servants' cottages of the most approved construction, and

we are inclined to think that in the matter of house accommodation for the labouring classes, Fifeshire stands second to no other county in the kingdom. An immense stretch of fencing has also been erected since 1850; but still much, very much, remains to be done in this respect. Ring fencing is pretty complete, but there is a great want of interior or dividing fences. Every successive year, however, adds greatly to supply this much-felt deficiency, and before many years have past, it will in all probability be fully supplied. The true character or real value of these, and all similar improvements, must of course be found reflected in the rent-roll; and thus the following table of the total valuation of the county (exclusive of railways and burghs) at various periods since 1674 will be noted with interest:—

1674,	L.363,129 Scots	1866–67,	L.611,353 Sterling
1695,	369,786 „	1868–69,	645,335 „
1815,	405,770 Sterling	1870–71,	635,813 „
1849–50,	597,774 „	1872–73,	661,648 „
1855–56,	543,536 „	1873–74,	667,059 „
1860–61,	567,446 „	1874–75,	698,470 „
1864–65,	581,127 „		

Increase since 1815, L.292,700 sterling.
Increase since 1850, L.100,696 „

An increase during the past twenty-five years of L.100,696, or an average of close on L.4036 a-year, is very creditable indeed, though it may not quite compare with the rise in the rental during the same period in some other counties, especially in the northern regions of Scotland. It must be kept in mind that, as already stated, and as borne out by the table of figures just given, the principal reclamations and improvements which go to increase the valuation of a county were executed in Fife previous to 1850, while in these other counties it is chiefly since then, or shortly before that date, that those operations were carried out. The considerably greater increase during the past half century in the value of grazing land, compared to arable land, has also tended to retard Fifeshire in the general advance of rental.

Some half a century ago the county of Fife occupied a slightly higher position than it does now in the *comparative* valuation list of counties of Scotland. Its valuation for its acreage, or say its valuation per acre, compared with that per acre in the other thirty-two counties in Scotland, was slightly higher then than now. Not that Fifeshire has been receding or sluggish in the race, on the contrary it has been gradually and steadily moving onwards, but other counties (taking up the good work begun by the farmers of Fife and southern agriculturists generally, and carrying it on, too, with all that spirit and zeal so characteristic of our Scottish farmers) have been gaining ground upon it. Fife stands seventeenth among the Scottish counties with respect to gross acreage,

six—Inverness, Argyll, Ross, Perth, Aberdeen, and Sutherland—being close on four times its size; while other four—Dumfries, Ayr, Lanark, and Kirkcudbright—are nearly twice as large. In 1815 Fife occupied the proud position of fourth highest in Scotland with regard to valuation, the three higher counties being Lanark, Perth, and Ayr, while Forfar came fifth, and Aberdeen sixth. Now it stands fifth, Aberdeen having not only made up to its spirited little rival in the south (for little it may be called when compared with Aberdeen, a county four times its size), but passed it by about L.17,158—a comparatively small sum, however, taking into account the difference in the size of the two counties. The following table shows the position Fife occupied in 1815 and occupies now, in comparison with the sixteen counties that exceed it in gross acreage:—

	Acreage.	Rental in 1815.	Rental in 1874-75.
Inverness,	2,723,501	L.185,565	L.310,118
Argyll,	2,083,126	227,493	429,384
Ross (including Cromarty),	2,016,375	121,557	256,402
Perth,	1,664,690	555,532	846,285
Aberdeen,	1,260,625	325,218	763,281
Sutherland,	1,207,188	33,878	76,720
Dumfries,	705,946	295,621	453,298
Ayr,	735,262	409,983	884,994
Lanark,	568,868	686,531	1,634,780
Kirkcudbright,	610,343	213,308	339,855
Orkney and Shetland,	598,726	20,938	91,194
Forfar,	569,840	361,241	648,340
Caithness,	471,763	35,469	117,687
Banff,	439,219	88,942	209,609
Roxburgh,	428,494	254,180	409,648
Elgin,	340,000	73,280	208,167
Fife,	328,427	405,770	698,471

It will be seen from this tabulated statement that Fifeshire's comparative position was a little more prominently to the front in the early days of the present century than now. It cannot be expected that a large annual increase of rental can go on for ever at the same ratio. A certain point once reached, then the increase must be limited; and we are of opinion that at 1815 the county of Fife had attained a higher elevation in the steep hill of advancement than most other counties between the Firth of Forth and John O'Groats. Hence the recent apparent gaining of ground by these other counties. They have done more than Fife, simply because they had more to do. The honour of having the highest annual valuation per acre in Scotland belongs to Lanark, but Fifeshire follows very closely. The total valuation of Fifeshire for 1874-75, exclusive of railways and royal burghs, is equal to no less than L.2, 2s. 6d. per acre, a fact that places the county

in a position of which it may well be proud. Of course Fifeshire has great advantages by the valuable treasures of its rocks, but, after making all due allowance for the rental of minerals and manufactories, the county stands very high indeed in a purely agricultural point of view.

It is somewhat difficult to ascertain exactly what the rise of the rent of arable land has been during the past twenty-five years, but we think we are not far wrong in putting it down at 25 per cent. From 1850 to 1860 there was a large increase of rent on all farms, the rise in some cases amounting to as much as 50 per cent. This large and very sudden increase was attributable chiefly to the high price of grain and potatoes during the Crimean war. Almost every year, from 1853 to 1867, potatoes at some time during the season reached the high price of L.5 per ton, and hence quite a potato mania arose in the county. Potato land was rushed after, and fabulous rents paid for it; and it is not too much to say that the step thus taken by a large number of the Fifeshire farmers was the most unprofitable step that has been attempted in the county during the last fifty years. Of this subject, however, more anon. Since 1860 the value of clay land has considerably decreased, owing to the low prices of grain for the crops of 1862, 1863, and 1864, and since the latter year to the increased cost of labour and other working expenses. One county agriculturist, whose opinion is entitled to much consideration, assures us that "there is no increase in the value of the rent of clay land as compared with the rents of 1850, but that the rent of good green crop land has increased 20 per cent.;" and we have met with several others who coincide in this opinion regarding the clay land. We could point, however, to several clay farms that have been slightly raised since 1850, but, speaking generally, the rise has not been large. In fact, much of the clay land was so highly rented previous to 1850 that very little more could be added without "rack" renting the tenants. During those few years that the Crimean war lasted the competition for farms was so excessive that not a few were induced to offer rents which they afterwards found themselves unable to pay, and thus deductions had to be made in several cases, some before one half of the lease was run. Had those fabulous prices that were paid for grain and potatoes between 1853 and 1867 continued, even the very highest rented farm in the county would have proved a a most profitable speculation; but this could not have been expected, nor, in fact, was it to be desired. During the past ten years the increase in the rental in the Kirkcaldy district has been no less than L.42,516, while in the St Andrews district the advance has been L.36,002. Manufactures and minerals have swelled the increase in the Kirkcaldy district considerably; but in the St Andrews district the rise is due almost entirely to an

advance in the rental of farms. The Dunfermline district, the great mining centre of the county, shows an increase of L.20,544, or about L.1500 more than the Cupar district.

Modern Farming.

The system of farming that obtains in Fife at the present day is, on the whole, of a most improved description, and is quite abreast of the times; but before proceeding to discuss the various farming customs, it may not be out of place to introduce a few loose notes on a tour which the writer made throughout the county. The starting point was Tayport, and the route—a waving one—along the outskirts, ending where it began. It was in the "head hurry" of the harvest, and all were busy in the fields. Cutting, a little more than half finished, was proceeding with great rapidity in every direction, the birring of the reaper being the prevailing sound. We visited several farms along our course, and saw much to interest and instruct, much to admire and little to find fault with. Close to Tayport, and situated on a slope looking south-west, is the fine farm of Scotscraig Mains. It is the property of Mrs Maitland Dougall of Scotscraig, is leased by Mr Peter Christie, extends to 502 acres, and is rented at L.1210, being a rise of about L.233 since 1864. Mr Christie, a gentleman of very extensive experience in the valuation and cultivation of land, works the mains on the seven-shift system of rotation, viz., 1st, oats; 2d, beans or potatoes, or more frequently part of both; 3d, wheat; 4th, turnips; 5th, barley; 6th, hay; and 7th, pasture. He breeds neither cattle nor sheep, but buys in large numbers of both for the grass, and feeds them off in winter with turnips and artificial food, of which latter commodity he uses an immense quantity. The soil on the most of this farm is strong loam, suitable for almost any kind of crop. Leaving Scotscraig, and proceeding along the north coast in the direction of Newburgh, we pass through the parishes of Forgan, Kilmany, Balmerino, Creich, Dunbog, and Abdie, at the north-west corner of which Newburgh is situated. In Forgan, as all along this course, the soil is light but fertile. The principal farms in this parish are Newton and Kirktonbarns, the former of which extends to about 774 acres, and is leased by Mr George Ballingall, the rent being L.1139. Mr Carswell, the proprietor of the estate of Rathillet in Kilmany, holds the home-farm in his own hands. It extends to 643 acres, and is valued at L.1132. The fine valuable farm of Wester Kilmany is held by Mr Watt, and is rented at very close on L.3 per acre, or an increase of a little over 12s. during the past ten years. The parishes of Balmerino and Creich can boast of several extensive and very fine highly-cultivated farms, the larger ones being Fincraig and Pitmossie, extending to 450 acres; Peasemills, measuring 348 acres;

Carphin and Lutherie, 645 acres; and Creich, 354 acres. The soil in the tract of land over which these farms extend is very variable, as will be inferred from the fact that the rents vary from L.1, 10s. to close on L.3 per acre. The little parish of Dunbog, through which we next pass, contains a few large farms, but none of them exceed L.2, 5s. per acre. The farm of Dunbog, leased by Mr John Ballingall, extends to about 735 acres, the rent being L.910. Besides this farm, Mr Ballingall holds several others, and pays in all between L.2400 and L.2500 of annual rent. He, like the majority of farmers in his neighbourhood, works his farms chiefly in seven shifts, but occasionally he takes three years' grass. He breeds and rears a large number of sheep, while he generally owns about forty cows. He feeds very extensively, and consumes upwards of L.1800 worth of cake every year. The soil in the parish of Abdie varies very much, some parts of it being excellent, and some light and very inferior. Perhaps the best farm in the parish or neighbourhood is Parkhill, a valuable holding situated close to the royal burgh of Newburgh. It extends to about 480 acres, and is rented at L.1420, or an advance of about 16s. per acre since 1864, the tenant being Mr A. W. Russell. Part of this farm lies on a low level, close on the banks of the Tay. The fields next the river were reclaimed less than fifty years ago, the present farmer remembering to have seen boats floating about where he now reaps abundant crops. The soil is chiefly alluvial clay, part of it being strong and deep. The rotation pursued on this level is eight shifts—1st, oats; 2d, potatoes or beans; 3d, wheat; 4th, potatoes or beans; 5th, wheat; 6th, turnips; 7th, barley; and 8th, grass. Turnips and beans grow well, while wheat and oats grow fairly, and barley very well. A considerable portion of the farm lies on a steep slope overlooking the Tay. The soil here is light loam and black earth, and the rotation five shifts—1st, oats; 2d, turnips; 3d, barley; 4th and 5th, grass. Mr Russell rears about twenty-five calves from cross-cows and shorthorn bulls. He generally feeds about fifty head of cattle every winter, buying in stirks or two-year olds to supplement his own lot. An abundant supply of turnips is liberally backed up by cake, and in the month of December Mr Russell often sells at L.30 a-head. He is careful to buy in the best stock that can be had, but still it is very apparent that the animals of his own rearing come out best in the feeding. Mr Russell has an excellent farm-steading supplied with covered courts, and the two-year olds are kept in the house all summer and fed on cut clover, the cows and stirks being grazed outside.

Taking the train at Newburgh we next land at Collessie, passing on our way a number of large, carefully-cultivated farms. The parishes of Strathmiglo, Abernethy, Auchtermuchty, and

Falkland, which lie on the west of the line, are very irregular on the surface and variable in soil, the predominating kind being light, friable, fertile loam. These parishes contain several very large farms, rented at from L.1 to L.1, 15s. per acre. Close to the Collessie Railway Station lies the compact valuable estate of Melville, belonging to Lady Elizabeth Melville Cartwright. Mr Cartwright (Lady Elizabeth's husband) is an enthusiastic, experienced agriculturist, and the estate is a model of regularity and system. Considerable improvement has been effected on the estate in various ways during the past twenty-five years. A large breadth of very fine wood was cut down, part of the land thus cleared being replanted and part reclaimed. One farm of 250 acres has been lined off and fenced. Of this, 100 acres were trenched at a cost of about L.6 an acre, and having been put into regular rotation, the farm was let to Mr Birrel for nineteen years at a rent of 15s. per acre for the trenched land, and 3s. per acre for the unreclaimed land, which is intended to be brought under cultivation immediately. Before the tenant entered a new dwelling-house and farm-steading were built. The land is so dry and porous that very little draining was required. Besides these improvements Mr Cartwright has just erected about 12,000 yards of very superior wire fencing. The posts and strainers are all unusually heavy and strong, while the wire is of the best galvanised plaited description. The wires are six in number, and are placed so as to keep in sheep. Mr Cartwright has also erected a number of very superior labourers' cottages throughout his estate, while at his home farm, which is under the able superintendence of his factor Mr Andrews, he has most successfully established a herd of polled cattle. Of the herd, however, more anon. Adjoining his magnificent gardens Mr Cartwright has a neat little nursery, into which he plants his young trees for a short time before planting them permanently. The plants are brought in at the usual stage for transplanting, but are put into the nursery for a short period to strengthen the rootlets, a system that is found to be most advantageous to the growth of the trees. One of the principal farms on the Melville estate is Nisbetfield, a very carefully cultivated holding, lying in close proximity to Melville House, the ancient baronial residence of the Leven family. The tenant is Mr Archibald, and the rent about L.1, 7s. per acre, The soil generally is light loam, with a few spots of clay. In our route from Melville towards Cupar we pass a number of very excellent farms, large and well cultivated. In the parishes of Dairsie and Kemback there are a few as fine farms as can be seen anywhere in the county. About the centre of the latter parish, and close to Dura Den—that classical spot so famous among geologists—lies the valuable little estate of Blebo, the property of Mr Bethune, an agricul-

turist of great enthusiasm, untiring energy, and considerable experience. Mr Bethune works the home farm himself, and pursues a most advanced system of farming. The soil is partly strong heavy clay, and partly deep able black loam. He cultivates at a great depth, chiefly by steam, and manures well, raising magnificent crops of all kinds, especially barley. He believes in Mr Lawes' system of continuous barley growing, and intends giving it a trial. The climate here is exceedingly mild and genial, and with such fertile soil and good seed almost every grain of seed that is sown germinates and produces a rich return. In 1873 he sowed one field with only one and a-half bushels of barley, and had a very heavy crop yielding seven quarters per acre, while last spring he sowed another with two bushels, the crop of which happened to be in process of being cut when we visited Blebo. It was extremely heavy, all laid, as thick on the ground as it could well stand, and had the appearance of yielding from seven and a-half to eight quarters per acre. Very fine crops of turnips and beans are also grown here, while last year Mr Bethune had a small field of carrots which yielded about six tons per acre, the price obtained for the ton being L.6. Another small field was put under carrots last spring, but they have not done quite so well, though they will yet afford a fair return. The finely sheltered situation and the picturesque wooded policies of Blebo fit it specially well for the rearing of stock, and Mr Bethune has been well known for a number of years as a breeder of shorthorns, while he breeds a few sheep and also rears or buys and feeds a large lot of excellent cross cattle. The herd of shorthorns merits more than a mere passing notice ; but this will be done when speaking of stock generally. The scenery around Blebo is magnificent, the view from the handsome mansion-house being one of the finest to be had in the county. The Mains of Blebo, which adjoins the home farm, is leased and very carefully cultivated by Mr Rintoul. The farm-steading is large, commodious, and very convenient, and has admirably well-constructed close courts. At the farm of Todhall, occupied by Mr Bell, and situated about four miles east from Cupar, one of the finest farm-steadings, not only in Fife but even in Scotland, is to be seen. It was erected some ten years ago by the proprietor, Mr Cheape, and when it is mentioned that the cost was about L.8000, some idea will be had of its character. At the farm of Rumgally, belonging to Mr Welch, and also in this neighbourhood, there is another very superior steading with roofed courts, though it is not quite such an extensive one as that at Todhall. Leaving Cupar and retracing our steps a short distance by train, we find ourselves next in the parish at Kettle. The farms at Ramornie and Balmalcolm, extending to 435 acres and rented at L.1084, form the principal

holding in this neighbourhood, and are leased by one of the leading agriculturist of the county, Mr William Dingwall. The six-shift system, so general in the best grain-producing districts of the county, is the rotation pursued by Mr Dingwall, but we understand that he contemplates changing into seven shifts, taking two years' grass instead of one as at present. The soil on these farms is partly heavy retentive clay, partly light loam, and partly sand, and some parts moss. The heavy clay and moss were troublesome to cultivate, and difficult to "make," so as to allow the braird to come away properly, and some fourteen years ago Mr Dingwall drove quicksand on to these parts, mixing the clay and moss and the sand together. A whole field was gone over in this way, about 1000 loads being spread on every acre, and now the land, formerly yielding indifferently, produces excellent crops of all kinds. The experiment was a pretty expensive one, but Mr Dingwall expects to be fully repaid for his outlay in a few years. He intends breeding a number of cattle as soon as he can turn his farms into seven shifts, but for many years he has raised only a few. His cows are Galloways, or first crosses between Galloways and shorthorns, and his stock bulls are carefully selected from the best shorthorn herds of the day, Mr Cruickshank, Sittyton, being frequently patronised. The calves are suckled and fed off as two-year olds, when an average price of L.28 is generally obtained. Mr Dingwall feeds liberally with turnips and cake, of which latter commodity he consumes a very large quantity—about L.500 worth every year. He takes parks in the grazing districts of the county, chiefly in the neighbourhood of the Lomonds, and buys in stirks or two-year olds to graze on them, but does not find the system a very remunerative one. He thinks that the more profitable system would be to graze on his own farm. He, like a large number of Fifeshire farmers, buys in half-bred hogs, and feeds them on grass, turnips, and cake. He seldom sows beans, but plants a considerable breadth of potatoes every year, and averages a return for the market of four, five, to six tons per acre, the refuse being given to the cattle. Oats range from five to seven quarters, barley from four to six, and wheat from three to five per acre. The farm-steadings are good, the cattle courts being covered, and very conveniently constructed. Mr Dingwall keeps seven pairs of horses, and allots about sixty-two acres to each pair. The farms of Ramornie and Balmalcolm were at one time very liable to flooding by the overflowing of a small winding stream; but a good deal of money has recently been spent in widening and deepening and embanking the course of the water by neighbouring proprietors and Mr Dingwall himself, and now no damage is suffered in this way. Proceeding a little further on, and passing a number of large farms, we next visit the home farm of Balbirnie,

which the proprietor, Mr John Balfour of Balbirnie, holds in his own hands. It extends to 378 acres, and is valued at about L.1, 15s. per acre. The soil is strong and a little stiff, while the climate is colder than in many parts of the county. Very few cattle are bred here, or indeed on the whole estate, the majority of the farmers preferring to buy in feeders to rearing them at home. A few shorthorns are bred at Balbirnie, while at Balfarg a superior Clydesdale stallion and a stud of mares are kept, Mr Balfour's tenants getting the service of the stallion if desired. This, as might have been expected, has manifestly improved the class of horses in the district, and Mr Balfour deserves much credit for his liberality. The improvements on Mr Balfour's estate during the past twenty-five years have consisted chiefly of draining and fencing, and in providing more accommodation for the consumption of turnips and straw than was required in the past century and in the first twenty-five years of the present, when only about five or six acres of turnips were grown on the largest farms in the county.

Taking the road once more, and proceeding in the direction of Dunfermline, that busy commercial town, famous as the burial-place of King Robert Bruce, we pass through the parishes of Kinglassie, Auchterderran, Ballingry, and Beath. The mining interest is very extensive in the district embracing these parishes; and as mines and agriculture seldom flourish equally together, it could not be expected that this would be the most valuable farming district of the county. Nevertheless there are a number of large and very carefully cultivated farms in these parishes. The soil is not of a very superior character, while the climate is only moderately good; and thus the rents are lower than in better favoured districts. A few of the farms are as high as L.2 per acre, but, on the other hand, a large number are not much beyond L.1. The principal farms in Kinglassie are Kininmouth, leased by Mr Blyth, and extending to 452 acres, and rented at L.650; East and West Pitteuchar, tenanted by Mr Gibb (who also holds Lochtybridge, a small farm of about 100 acres), and extending to 434 acres, the rent being L.874, or an advance of L.44 during the past ten years; and Fostertown, extending to 300 acres, and rented at L.442. The tenant of this latter farm, Mr Robert Hutchison, and his father, have by improvements at their own expense, raised its rent in little more than a hundred years from L.70 to the sum above stated. Mr Hutchison is a very careful, liberal farmer, and expends nearly double his rent in cake and manure every year. The farm of Dothan, in Auchterderran, measures 424 acres, and is rented at L.612; while the farm of Lumphinans in Ballingry extends to 803 acres, and is let at L.693. Hilton, in the parish of Beath, is rented at L.375, a few pounds less than in 1864, the extent

being 460 acres. Mr Henry Heggie leases a valuable holding of 300 acres at the south corner of Beath, known by the modern title of Mains of Beath. The soil is naturally good, and under five years' liberal treatment from Mr Heggie, has improved immensely. The farm is worked by four pairs of superior Clydesdale horses, the system of rotation being the six shifts. Mr Heggie cultivates carefully, and manures very heavily, and produces excellent crops of all kinds. His Swedish turnips this year are very superior. They are regular and very large, and look like affording a yield of from twenty-eight to thirty tons per acre, a yield which Mr Heggie has produced more than once. In addition to a large supply of farm-yard manure, they got six cwt. of artificial manure per acre, viz., 1 cwt. of nitrate of soda, 3 cwt. dissolved bones, and 2 cwt. bone meal. Mr Heggie keeps eight or ten very superior cross cows, and with these and a good shorthorn bull produces stock that invariably carries the places of honour at the Dunfermline Cattle Show. He was first last two summers with two-year old cattle at this show, and had also some prizes for sheep of his own breeding. He buys in calves to feed, and sells them off when from sixteen to eighteen months old, at from L.21 to L.22. For two-year olds bred by himself he has frequently received as much as L.36; while his hoggs generally bring about 50s. at the markets in early summer. The houses on the farm are good, but fences are very deficient. He has drained a great deal at his own expense during the past five years, and has now got it into excellent order. A few miles further west, and we reach the thriving town of Dunfermline. In the parish which bears the name of this town there is a large number of very fine farms, though the Dunfermline district is equally as famous in the mining and manufacturing as in the agricultural world. In the immediate neighbourhood of the town there are several large holdings. Little more than a mile north of the town lies the farm of Ballyeoman, occupied by Mr Henry Thompson. It extends to 212 acres, and is rented at L.329. The soil is composed of clay, of a strong adhesive character, and the system of rotation is the six shifts. Grain averages from five to six quarters, and weighs—barley, 55 lbs. per bushel; oats, 42 lbs.; wheat, 63 lbs.; and beans, 64 lbs. Mr Thompson cultivates well, ploughing stubble to the depth of about nine inches, and lea seven inches, and manures equally well. For turnips, he gives twenty tons farm-yard manure, three cwt. Peruvian guano, and two cwt. dissolved bones per acre; and for potatoes about twenty-five tons of farm-yard manure, without any artificial stuffs. He keeps a few cross cows, and rears calves from these and shorthorn bulls. He buys in a large number, however, sometimes Irish, and sometimes home-bred cattle. The home-

bred cattle, as with other farmers, invariably thrive best. Mr Thompson sells off his fat animals in the months of April, May, and June, and receives from L.26 to L.30 a-head. Sometimes from three to four score of sheep are wintered on the farm, and a good stock of excellent Clydesdale horses is kept. The houses and fencing are good. Since Mr Thompson entered the farm, a few years ago, he has effected extensive improvements at his own expense. He has made 2000 yards of road, erected a turnip shed, and two covered cattle courts; has cleared out 1000 yards of old hedging, in order to enlarge and square up fields; has planted some new hedges, built 1600 yards of stone and lime dykes, and drained about thirty acres of land. The drains were cut about three feet deep and sixteen feet apart. Mr Thomas Crawford holds several farms in the neighbourhood of Dunfermline. He resides at Pitbauchlie, and is an experienced, careful farmer. The soil on his farms is mostly thinnish loam, with a clayey subsoil. On part of his holdings he pursues the six-shift system, but on a large portion he has no regular rotation. Wheat generally yields about four quarters per acre, barley five, oats six, beans four and a-half, turnips twenty tons, and potatoes eight tons. He manures heavily, giving twenty-five tons of farm-yard manure and four cwt. of guano, or dissolved bones, per acre for potatoes, and fifteen tons farm-yard manure, with three cwt. dissolved bones and two cwt. of guano, for turnips. He breeds no cattle, but buys in a great many, partly to graze and partly to winter. About the autumn he usually buys in a number of half-bred ewes, and takes a crop of lambs off them, feeding both the ewes and the lambs, and sending them to the markets. He also buys in a few half and three-parts bred lambs towards the fall of the year, and feeds the latter on turnips, while the half-breds are kept for grazing the following summer. His farms are well-stocked with strong young Clydesdale horses. The fences and houses are bad, but the drains are in good order, having all been renewed by Mr Crawford at his own expense. He farms very differently from almost all his neighbours, inasmuch as he grows very little hay, and keeps a large portion of his land in pasture for three, four, and five years. In the parishes of Carnock, Saline, and Torryburn the soil, though not heavy, is friable and fertile, and the farms are generally in a high state of cultivation. The system followed is very much in accordance with that already noticed on such farms as Ballyeoman and Mains of Beath. Turning southwards from Dunfermline, and proceeding towards Inverkeithing, we pass through a highly fertile valley, known as the "Laich of Dunfermline." It bends down to a very low elevation, part of it being only about seventeen feet above the level of the sea. In this valley Cromwell is said to have fought one of

his many battles, and in the process of cutting drains, several horse shoes were dug up from a depth of three or four feet, and it is affirmed that these shoes belonged to the horses ridden by followers or enemies of this immortal warrior. The farm of Backmarch, lying in this valley, and extending to about 230 acres, is tenanted by Mr Mitchell. It is worked in six shifts, and its soil is chiefly strong adhesive clay, some parts being strong black loam. Mr Mitchell grows excellent crops of beans and good crops of potatoes, while oats and barley grow fairly. Turnips were usually very subject to damage by "finger and toe," but last season he tried an experiment which has proved an entire remedy. When the field on which the turnips were sown last spring was in grass, he spread a slight doze of slack lime over it, and the turnips show no signs of disease, which he attributes entirely to the action of the lime. Within the memory of some of the oldest inhabitants, a large stretch of the Laich was lying in a swampy, spongy, unhealthy state; but now it is comparatively dry, and is one of the best cultivated parts of the county. Mr Mitchell has redrained a good deal of the farm during the past few years; but still a few patches are in want of better drainage. In some of the more retentive parts of the farm, there are only about fifteen feet between the drains, and still the soil is not thoroughly dry. No pick is required in cutting the drains, and a three-feet drain can be dug at 2s. per chain. Almost all the old drains were laid with stones, but tiles are universally used now. The rents of a few farms in this neighbourhood have been tripled since 1800, and doubled since 1830. Proceeding by Inverkeithing along the coast to the picturesque little village of Aberdour, we pass a number of extensive and very highly cultivated farms. On the large and valuable estate of the Earl of Moray, in the parishes of Dalgety, Aberdour, Beath, and Auchtertool, numerous and very expensive improvements in the way of fencing, draining, and building have been effected during the past twenty-five years. A few acres of new land have been added to two or three farms in the parish of Beath; but the total acreage reclaimed since 1850 is not by any means large. The road from Aberdour to Burntisland winds along the coast through most charming wooded scenery, forming one of the most delightful walks to be had, even in the picturesque county of Fife, and during the summer and autumn months is the favourite saunter of many hundreds of holiday seekers, who crowd the rising little town of Burntisland. The soil on a good deal of the land around Aberdour, and running down to the Firth of Forth, is not by any means heavy, but it is friable and very fertile. The farms of Dallachy and Balram form the principal holding in the parish of Aberdour. They extend to about 600 acres, and are rented at L.1253, the

tenant being Mr Thomas Cunningham. The greater portion of the farm of Dallachy consists of strong fertile soil, while on Balram the land is chiefly thin loam. The heavy land is worked in seven shifts, with two years' grass, while the light land is worked in five shifts, one green crop, two grain crops, and two years grass. Dallachy produces excellent crops, barley sometimes yielding as much as eight quarters per acre, the average being about seven. Barley generally weighs from 53 lb to 56 lb per bushel, wheat about 64 lb, and oats from 42 lb to 44 lb. It is very seldom that much grain is lost here by bad harvests, but in 1872 Mr Cunningham sustained a loss of more than a year's rent by wet weather. Turnips grow well, and have never been finer than this season. The farm-steading is good, while the dwelling-house is excellent. Mr Cunningham recently commenced to rear calves from Galloway cows and shorthorn bulls, and as yet the experiment has been satisfactory. Moving a little further on we come to the highly cultivated farm of Newbigging. It extends to 280 acres, and is leased by Mr Prentice, who holds besides it the farm of Balbairdie, extending to 350 acres, and situate in the parish of Kinghorn; of Bankhead, also measuring 350 acres, and situate in the same parish; and Balgreggie, extending to 130 acres, and situate in Auchterderran. Newbigging is all arable, and grows very fine crops. This year there are 25 acres under wheat, 82 under barley, 26 under oats, 25 under potatoes, 20 under turnips, and 25 under hay. The remainder is so hilly that it is left lying in grass, and cultivated only when the pasture gives way. Most of this farm is on limestone rock, part of it being heavy clay and part fine friable turnip and barley land. Newbigging is situated close to the Grange distillery, from which Mr Prentice obtains large quantities of *draff*, which enables him to keep about 100 cattle and 300 sheep every winter. This gives him such a command of manure that he can grow almost any sort of crop without strictly abiding by any fixed system of rotation. Balbairdie is mostly heavy land, and here Mr Prentice has a breeding stock of half-bred ewes, and keeps the outside land in grass as long as possible. Four pairs of horses are employed in cultivating this farm, the system of rotation being—1st, oats or barley; 2d, turnips; 3d, barley or wheat; and 4th and 5th, hay and pasture. Bankhead is all fine haugh land, lying on trap rock. With the exception of a hilly field, which is kept a year or two longer in pasture than the rest, the whole of this farm is worked in seven shifts—1st, oats; 2d, potatoes; 3d, wheat; 4th, turnips; 5th, barley; 6th, hay; and 7th, pasture. Barley and oats yield from 5 to 8 quarters per acre, while wheat gives about 5 quarters. The return of potatoes ranges from 7 to 8 tons per acre. The lea is ploughed 8 inches deep, and broken up as soon as possible in March, and sown by a drill machine

with 2½ bushels per acre on the best land and with 3½ on the inferior land. Mr Prentice generally manures his turnips with a mixture of artificial manure entirely, but when farm-dung can be had he gives about 12 tons to the acre. Most of the potato land is manured on the stubble with 20 tons farm-yard manure, ploughed to as great a depth as possible, and seasoned with from 3 cwt. to 4 cwt. of guano and dissolved bones at the time of planting. The stubble land is generally ploughed 10 inches deep, and when the land is steep it is ploughed downhill, the depth of the furrow being about 12 inches. Balbairdie has all been limed and drained within the past twenty years at the expense of Mr Prentice, who has also expended a large sum on buildings. The farm of Balgreggie lies 10 miles inland, and is all under grass. A large number of the cattle required for feeding in winter are grazed here, which saves Mr Prentice from the necessity of buying in all his winter's stock at one time. The farm of Grange, adjoining Newbigging, and close to the town of Burntisland, is leased by Mr Walls, and is worked in six shifts. Mr Walls usually keeps about 24 cows, and rears their calves, buying in stirks to supplement the winter's stock at from L.14 to L.15 a head. When fat these animals are generally sold at from L.20 to L.28. The soil is good, and good grain and green crops are raised. About 200 hoggs are usually wintered on the farm, and fed or sold off lean as the state of the markets may determine. Leaving Burntisland and proceeding eastwards, through an extremely fertile border of land facing the Firth of Forth, we rest a little at Kirkcaldy, around which there are several very fine farms. In the parish of Kinghorn, which we have just passed, lies one of the best managed little properties in the county, that belonging to Mr William Drysdale of Kilrie. Mr Drysdale is a spirited agriculturist, and feeds a lot of very fine cattle, not a few of which do him much credit in the Christmas and other fat shows. The system of farming pursued in the Kirkcaldy district is almost identical with that already described on seaside farms, and therefore we need not waste time or space in detailing it. In the parishes of Wemyss, Scoonie, and Largo the farms are very variable in size. The soil is also variable, and rents range from L.1, 5s. to L.2, 10s. per acre. One of the finest farms in Largo is Buckthorns, occupied by Mr Beveridge. The soil is principally rich loam and fertile clay, and heavy crops both of grain and roots are grown. On a field on this farm we saw when passing as fine a crop of oats as we have ever seen anywhere. Inland, a few miles from Largo, principally in the parishes of Ceres, Cults, and Kettle, lie the valuable estates of the Earl of Glasgow. These estates are under the able and efficient supervision of Mr M'Leod, banker, Kirkcaldy (brother to the late celebrated Dr Norman M'Leod), who acts as factor in Fifeshire for

the noble Earl. Since 1850 the rental of these estates for farms alone has increased by about L.1700, while the revenue to the landlord from limeworks has advanced from L.318 to L.900 during the same period. The limestone is of the white variety, and when burned produces lime of very superior quality. The demand for it is yearly increasing, large quantities being exported out of the county. Extensive improvements have been effected of late in the way of draining and building, and though the rise in the rental is pretty high, yet it does not afford a fair return for the landlord's outlay. There is much need for more fencing on these as on all other estates in the county, but the buildings generally are good; and arrangements have been (or are being) made for the erection of several new steadings and cottages. On some parts the soil is strong clay and on others light loam. The five-shift rotation obtains for most part, only a very small breadth of potatoes being grown. Continuing our eastern course, and as we approach the famous "East Neuk," we enter, perhaps, the finest agricultural district of the county. The land all over the East Neuk, though a little strong and retentive in some parts, is sure and very productive, and is rented at high figures, some of it as much as L.4 and L.5 per acre. One small patch, in fact, brings in to its fortunate proprietor the enormous and almost unequalled rent of about L.8 per acre. The estates of Balcarres, belonging to Sir Coutts Lindsay, Bart.; of Balcaskie, the property of Sir R. Anstruther, Bart., M.P.; Kilconquhar, belonging to Sir John Bethune, Bart.; of Charleton, the property of Mr J. A. Thomson; Gilston, belonging to the heirs of the late Mr Baxter; and Gibliston, belonging to Mrs Gillespie Smyth, and situated chiefly in the parishes of Kilconquhar, Elie, Abercrombie, and Carnbee, are under the experienced hand of Mr Flockhart, banker, Colinsburgh. The improvements on these estates during the past twenty-five years have consisted chiefly of draining and building, and the sum expended in this way on the various estates during that period has been about L.42,000. The soil varies from thin clay to rich alluvial land, and is rented at from 17s. 6d. to L.4 per acre. The increase of rent since 1850 has been on an average about 20 per cent., a few farms having risen as much as 50 per cent., while others have not advanced any. The houses are generally in good order and suitable for the farms, but with a few exceptions fencing has been neglected. The farms are generally well supplied with cottages, and "bothies" are now few and far between, the majority of the servants being married. The general system of cropping is the six-course shift, viz., 1st, oats; 2d, potatoes, beans, or turnips (or fallow); 3d, wheat; 4th, turnips; 5th, barley; and 6th, hay. Very few cattle or sheep are bred on these estates, but a very large number of both are bought in and fed, the sheep eating the turnips off the light land. Ap-

proaching nearer to the Neuk we come upon a number of large very fine farms, almost all of which are worked similarly to those on the estates just referred to. A belt of land along the coast is rented at from L.3 to L.5 per acre, while about two miles inland it falls to about L.2 or L.2, 10s., and other four miles inland to from L.1, 10s. to L.2. Few cattle are bred in the East Neuk, though a large number are bought in and fed. Along the coast wheat generally yields 4½ to 6½ quarters per acre, and three or four miles inland, from 3 to 5 quarters; barley on the coast, from 5 to 8, and three miles inland, 3½ to 5½; and oats on the coast, from 6 to 9, and three miles inland, from 4½ to 7 quarters. Wheat on the coast usually weighs from 61 lb to 63 lb; barley from 54 lb to 57 lb; and oats from 42 lb to 43 lb; the difference inland being about 2 lb in each case. The farm of Balcomie, close to Fife Ness, is occupied by Mr George Downie. It extends to about 297 acres, and is rented at L.1045, 10s., being an increase of about 40 per cent. since 1864. The soil on this farm close to the shore is easy green crop land, specially well adapted for potatoes, while about two fields' breadth inland it is able heavy land, well adapted for wheat. The farm is worked on six shifts. Wheat averages a return of about 5 quarters per acre, barley 8 quarters, and oats 7 quarters. For Swedish turnips Mr Downie usually gives about 20 tons farm-yard manure, and 5 cwt. guano per acre; and for yellows a heavy doze of seaweed or 15 tons of farm-yard manure, with 2 or 3 cwt. of guano. The potato land is dunged before being ploughed out of stubble, with about 25 tons farm-yard manure per acre, or where seaweed can be had in sufficient quantity it is applied instead of the dung. Mr Downie and his son hold two farms in the west of Fife, both of which are under grass and stocked with blackfaced sheep. Very few cattle are reared at Balcomie, but a large number are bought in and fed. Between the East Neuk and St Andrews the soil varies a little, but is on the whole very good, and is particularly well cultivated. Mr Duncan of Kinkell is perhaps the largest farmer in the county. He has been a farmer for a great many years, and has been singularly successful, being now the possessor of the valuable little estate of Kinkell, in the parish of St Andrews, and the tenant of some three or four farms from other landlords in this part of the county. The annual value of the land he farms is considerably upwards of L.5000. His brother, Mr Duncan, the tenant of the farm of Pusk, in the parish of Leuchars, is also well known as an enthusiastic experienced farmer. He feeds a very large number of cattle every year, using an immense quantity of cake and other feeding stuffs. He farms very liberally, and grows excellent grain and green crops. Mr Reid, Cruvie, is another very prominent farmer. His holding is situate in the parish of Logie, extends to 526 acres, is

rented at L.1031; and he displays much care and experience in its cultivation and general management. Mr Reid has a promising little herd of shorthorns, but it will be noticed afterwards. Leaving the village of Leuchars and proceeding towards Tayport we pass over "Tents Moor," an extensive level tract of land covered up with sand, and almost useless for all agricultural purposes. Tayport is reached, and we are now at the end of our tour, a tour which, though accomplished hurriedly, has been both interesting and instructive. And we would fain hope that our hasty notes, imperfect though they be, will not be altogether devoid of interest to others.

Farming customs generally must now be noticed. The duration of leases is almost universally 19 years. There are a few longer, a few shorter, and a few life leases; but fortunately this latter period of tenure is now seldom, very seldom granted. Martinmas is the usual term of entry. The first half-year's rent is payable at the term of Whitsunday after reaping the first crop, and the second half at Lammas thereafter, eighteen and twenty-one months after entry. There are a few exceptions to this rule, but only a few; and on the whole the system must be regarded as quite satisfactory to the tenant.

In the matter of land apportionment Fifeshire is almost all that could be desired. The following table shows the number of holdings in the county of various sizes from under 5 to above 100 acres:—

Not exceeding 5 acres.	From 5 to 20 acres.	From 20 to 50 acres.	From 50 to 100 acres.	Above 100 acres.	Total.
565	441	203	224	808	2241

Compared with the other counties in Scotland, Fifeshire stands eighth on the list of farms above 100 acres, twenty-fourth of farms between 20 and 100 acres, and sixteenth of holdings below 20 acres. The percentage of holdings below 20 acres is 45, above 20 and not exceeding 100 acres 19, above 100 acres 36. It will thus be seen that the holdings above 100 acres are in the majority, but the scale of increase in size from 5 to 100 acres is very gradual, while the number of small crofts is neither too large nor too small, the county being as near as might be in the centre of the other thirty-two Scotch counties in this respect. Of the 808 farms above 100 acres there are only 39 above 500 acres, the large majority being between 250 and 350 acres. As in most other Scotch counties a good many farmers hold two or three, and perhaps four pretty large farms. It is very seldom, however, that two farms, though leased by one man, are run together, but are judiciously kept as separate holdings.

The system of rotation varies a good deal; but in by far the

majority of cases, especially in the best arable districts, the six-shift course obtains, viz.:—

1. Oats.
2. Potatoes or Beans, or both.
3. Wheat.
4. Turnips.
5. Barley, and
6. Hay or Pasture.

This quick continuous succession of grain crops is necessarily very trying to the land, and also heavy on the labour and manure bills; and on these and various other grounds we would decidedly prefer the seven-shift course—*i.e.*, two years' grass instead of one. It is said (and probably with some degree of truth) that the soil of Fifeshire does not suit grass, and (which is more doubtful) that it is much too highly rented to admit of its being kept two years under pasture, or one year hay and another pasture. But were the land thoroughly limed and sown out in good condition or not so much exhausted during the rotation, we are pretty certain (in fact we have had substantial proof of it) that grass would grow at least moderately, except perhaps on a few of the very strongest clay farms. And as to the financial part of the question, we are still more confident that the substitution of the seven shifts for the six would be a most advantageous change. Besides putting the land into a better and richer condition, we are satisfied that this system of rotation would yield a larger return to the tenant at the end of say two courses, or fourteen years. In fact, not a few hold that at end of even one rotation it would show larger profits. Its advantages over the six-shift course are many and various. As already hinted, less manure and less labour, two of the most important items of the farmer's expenditure, would be required, while it would enable farmers to keep a larger number of cattle and sheep during summer. As matters presently stand, only a few, a very few, cattle and sheep can be grazed in the county. In fact, one might travel for miles through some districts during the summer months and not see a single animal of the cattle and sheep species, excepting perhaps a few cows which are kept at each farm to supply milk, and a few "pet" ewes and lambs which run about the houses. A large portion of the field sown out with grass seeds is left under hay, and hence it is only in the higher lying and inland parts where several farmers take two years' grass that any grazing can be had. It is argued by many farmers, that while their land continues to be rented at its present figure they cannot afford to employ it, or any part of it, in the rearing of stock; in short, that the only way in which they can make a profitable overturn of their money is to raise the greatest possible quantity of grain and potatoes. Though the majority argue thus, a good many take a different view of the matter. One of the leading agriculturists of the county with whom we happened to be discussing the question said, "It appears to me that it would be profitable to breed more

cattle. There are a great many cattle fed, but I am of opinion that it would be more profitable to the farmer to breed a larger and feed a small number of cattle." That it would be advisable to lessen the number of cattle fed we are scarcely prepared to say; but it seems perfectly clear that it would be profitable to breed more, and at any rate graze a great many more than at present, and that not only of cattle but also sheep. When cattle can be reared to realise from L.28 to L.30 a-head when twenty-four months old, it is not very easy to understand how cattle-breeding would not be a profitable undertaking to the Fifeshire farmers. The figures stated are not by any means beyond the general run of prices for good two-year olds; and when an animal can produce L.28 for twenty-four months' keep, it must be admitted that that animal affords a very handsome return for the outlay upon it. Of course the expense of maintaining its mother must be deducted, but even then the return is a large one. We take it for granted that the value of the cow's milk, beyond the nursing of her own calf, would meet the interest of the money lying on her, and perhaps part, if not all, of the loss by "tear and wear." We do not deny that by buying in cattle instead of rearing them himself a farmer can make more money by the transaction "pure and simple," at least so long as he can purchase good stirks in the months of August and September at from L.16 to L.18 a-head and sell them off in March or April at from L.26 to L.28. But the various advantages arising to a farm by the keeping of a herd of cows are worthy of consideration, and taking everything into account, we are decidedly of opinion that it would be highly remunerative for the Fifeshire farmers to breed at least one-half of their stock themselves. Undoubtedly close and careful attention require to be paid to a breeding stock, but they are worthy this trouble. We do not think that it is at all desirable that a farmer should be entirely dependent upon the autumn or indeed any markets for a "fill" to his feeding-stalls; and at the present day Fifeshire may be said to be entirely dependent on the outer world for the stock it requires during winter—a very large stock it is. It seems somewhat strange that the "Kingdom of Fife," so independent and self-supporting in so many respects, should be entirely at the mercies of the outside world for cattle and sheep to consume its turnips and straw. Yet "true it is; and pity 'tis, 'tis true." A very large majority of the cattle introduced are Irish, and hence the county is continually kept in a state of disease, often from both pleuro-pneumonia and "foot and mouth." During the past few years several farmers who kept no cows before, except what were required for milk, have commenced to rear a number of calves, while we hear of a good many more who are contemplating the same course; and we feel pretty certain that before another quarter of a century is past the breeding stocks of

Fifeshire will not be counted by scores but by hundreds, and that the Irishman's sway of the markets of that county will become a thing of the past.

Every year since 1853, when the Crimean war raised the price of potatoes to from L.4 to L.5 per ton, a very large breadth of land has been put under this esculent; and considering that the crop, taking an average of a rotation, is now the opposite of a remunerative one, it seems a little surprising that so many should have stuck to it so long. Had the price remained even at L.4 per ton the crop would still have been a profitable one; but now that the price has been reduced by nearly one half, and that labour, of which potatoes require so much, has been nearly doubled since 1853, the balance sheet for the potato field presents a very different appearance. Now every acre of potatoes costs the farmer about L.12, and on an average of say six years very little more is realised in the market. With few exceptions farmers themselves admit that the potato crop does not pay; some say it is the worst paying crop in the rotation; while one county agriculturist of very extensive experience declares that, in his opinion, the potato mania which arose in 1853 "has been a curse to the country." The crop, however, has many things to be advanced in its favour. It is peculiarly a speculative crop, and certainly affords a very large return in some seasons. It also prepares the land specially well for wheat, and perhaps on this account, more than any other, it is still retained in the rotation by a great many farmers. Rather than run the risk of losing money by planting potatoes, a good many farmers have of late been leaving part of their second shift under "fallow." This enables them to cultivate and clean the land thoroughly, giving labour to the servants during the slack season, and resting the land so as to ensure an extra crop of wheat the following year, a consideration which is often more important than the small profit that might be realised from a potato crop. Potatoes necessarily extract much of the richest substance of the soil, and it is generally the case that after a good crop of potatoes comes a bad, or a moderate crop of wheat, and after a bad crop of potatoes a good crop of wheat. Other farmers divide their second shift between potatoes and beans, putting potatoes in the one half the one rotation and in the other half the next; while a few add turnips, and work in a similar way with the trio.

The time and mode of cultivation in Fifeshire correspond very closely to the time and mode of cultivation in most other counties in the south of Scotland. The whole of the land intended for cropping, with the exception of the portion under turnips, is ploughed in the autumn or winter, the depth of the lea furrow varying from 5 to 8 inches, and that of the stubble from 8 to 12 inches. The turnip land or clean ground is ploughed as early

as practicable in the spring, while the fields intended for turnips and potatoes are in some cases scarified or cross ploughed or grubbed during the winter, thus giving the frost full play upon the soil. Weeds are generally plentiful, but, as a rule, great care is taken to clean the land well. Rolling stones or surface boulders were never very abundant, and what did exist have long ago been driven to the edges of the fields or utilised in drains and fences. As will be inferred from the stiff nature of much of the land, and the depth to which it is ploughed, the Fifeshire soil is heavy on horses; strong Clydesdales are generally kept, and, on an average, only about 60 acres are allotted to each pair—a small breadth compared with several of the other counties of Scotland. On the lighter soils a pair of horses sometimes work as much as 80 acres; but taking the county as a whole, the average is not much above what we have stated. The farmers of Fifeshire cultivate their soil with no niggard hand. They manure liberally and cultivate carefully; and, in fact, spare neither pains nor expense to bring the utmost out of their holdings. Artificial manures are used very extensively, and have been so for a considerable number of years, while an immense quantity of the very best of farm-yard manure is made every year and all spread on the land.

Fifeshire stands almost unrivalled with respect to the implements employed in the cultivation of its soil. All the most improved farm implements of the day are in use in Fifeshire, while manual labour is economised to the utmost possible degree. Double furrow ploughs are worked on several farms, but are not generally approved of. The single and drill ploughs, however, have all the modern improvements. Iron harrows are used almost exclusively, while the sowing and reaping of the grain crops are accomplished by machinery on nearly every farm above 50 acres, and many even below that. Steam is the prevailing power in thrashing the grain, there being also a good many water and horse-mills in the county. A number of portable thrashing-mills traverse the county, and are extensively employed. In a large majority of cases the thrashing-mills are fitted up with apparatuses for thoroughly preparing the grain for the bags, while a great many also convey it to the granary.

Steam Cultivation.

We know of very few counties in Scotland better suited for cultivation by steam than Fifeshire. Leaving out a few of the higher lying parts, and the parts most cut up by collieries and other mineral operations, almost the whole of the remainder of the county might be cultivated by steam. The surface, though a little undulating, is seldom steep, and the fields are generally pretty large and conveniently shaped. No stones (at least if

there are any, they are few and far between) would interrupt the course of the tackle, while the advantages which the soil of the county would derive from steam cultivation would be very important indeed. It is admitted on all hands that steam cultivation, wherever properly managed, has had an extremely beneficial effect on the soil; and it is on such soil as that of Fifeshire that its influence would be felt the most. The soil of Fifeshire, as a rule, requires deep cultivation, and much of it being very stiff and adhesive, horses are severely tried in working it. Though it has not yet been used very extensively, steam-power has been employed less or more on a number of farms in the county for several years. The Scottish Steam Cultivation Company has always two, and often three tackles working in the county, while two or three private tackles are also employed. Mr Rintoul of Lawhill works one tackle on his own estate, and the Hon. George Waldegrave Leslie of Leslie purchased an 8-horse power steam tackle that was exhibited at the Highland and Agricultural Society's Show at Glasgow last summer; while we understand that Mr T. L. M. Cartwright of Melville has arranged to get a similar one. The Scottish Steam Cultivation Company is fortunate in having for its Fifeshire representative Mr Bethune of Blebo, a gentleman who has long advocated the desirability of the adoption of steam cultivation, and who himself adopts it so far as is practicable. He is one of the directors of the company, and takes a very lively interest in everything pertaining to its welfare and to the advancement of the great cause it seeks to promote. The company's tackles employed in Fifeshire are under the able management of Mr Gilchrist, Carvenom, Anstruther—a careful systematic farmer, with extensive experience in steam cultivation.

Buildings, Roads, Fences, and Drains.

Buildings.—As already hinted, Fifeshire stands pre-eminent in the matter of houses of all kinds. The dwelling-houses of the farmers, with a few exceptions, are of the first order. They are generally large and conveniently constructed, while with respect to architectural appearance, many of them are very handsome. As already stated, the number of proprietors' houses is very large, and of these by far the majority are very handsome structures, surrounded by most magnificent gardens. It is not to the landlords' residences alone, however, that the fine gardens are confined. They are to be found all over the country, almost every inhabited house, even the majority of the smallest cottages of the labourers being encircled by their fruitful gardens. The climate of the county is extremely favourable for the growth of fruit, and the crop of fruit of all descriptions which some of these neat little gardens produce in a year is perfectly marvellous. House

accommodation for agricultural labourers and working people generally is now almost all that could be desired, the improvement that has been effected in this matter during the past thirty or forty years having been very great indeed. With a very few exceptions, the whole of the farms in the county are supplied with servants' cottages, and the deficiency that still exists is speedily becoming less. The houses of the labouring classes in the many towns and villages which are dotted over the county are also of a superior character, and are gradually being improved where improvement is necessary. The general character of the farm-steadings in the county is very good indeed. They are mostly all large and commodious, a great many of them having been erected since 1850. On almost all the large farms, and on many of the smaller holdings, the cattle courts are covered, or at least partially so. The advantages of a commodious convenient farm-steading are now fully recognised on every estate, and it is a special aim both of landlord and tenant to provide this great desideratum. The value of covered courts has also been fully established, and no farm-steadings are erected now-a-days without them. We do not think that it is beneficial to have the courts wholly covered, and in by far the majority of cases in Fifeshire only about one-half of the court is under roof. The many and various advantages of these covered courts are already so well known to all interested in any way in agricultural matters, that it would be needless to enumerate them here, suffice it to say, that without doubt they form the most valuable of all the modern improvements in the construction of farm-buildings. So far back as 1850, covered cattle courts were to be found in Fifeshire; one, the first in the county if we mistake not, having been erected at Blebo home farm about twenty-six years ago.

Roads.—The county is particularly well supplied with roads. At an early period of the county's history the principal public thoroughfares were very good, and of late they have been considerably improved, while the mileage has been greatly increased. Accommodation roads, generally speaking, are excellent; while almost every corner of the county is particularly well supplied. There are seven road trusts in the county, and the total annual income usually amounts to close on L.11,000, while the expenditure is generally very nearly as large; the roads being kept in excellent repair. Tolls still exist in the county.

Fences.—Fifeshire being so exclusively a grain-growing and so little a grass-producing county, it could not be expected that fencing would form one of the leading features of its agricultural development. Not only, however, does it not form a leading feature, it is one of the most neglected branches in farming; in fact, we think that there is no matter whatever connected with the agriculture of Fife which calls so loudly for improvement as fencing. A

few farms are undoubtedly well fenced—two or three completely enclosed—but, speaking of the county generally, there is a great and a much-felt want of fences. Ring fences, or fences which separate farms, are pretty complete in most parts, but on a very large majority of the farms of the county interior fences are almost entirely wanting, or at least are very partially provided. In the grazing districts of the county fences are pretty plentiful, but in the parts where the six-shift system of rotation obtains—and these parts represent by far the greater portion of the county—they are very scarce indeed. So few cattle and sheep being grazed in these last-mentioned parts, the want of fences of course presses much more lightly than it would otherwise do; but still it is felt and complained of too, and we doubt not but fencing will occupy a prominent place among the Fifeshire agricultural improvements of the immediate future. Thorough fencing is an inestimable boon to the farmer, and in fact is almost indispensable on a grazing farm. Of the fences which presently exist in Fife, wire predominates, but there are also a good many dykes and a considerable stretch of hedging. Whether for substantiality or shelter, hedging forms the best fence of all, and is being adopted much more largely now than formerly. A large number of farmers fence their grass fields with portable wire fences.

Drains.—The drainage of the county is in a most efficient state. The greater portion was very fairly drained many years ago; and during the past thirty or forty years the whole of the county has been thoroughly redrained; a good deal of it twice over. In many parts the subsoil is exceedingly retentive, and could not be thoroughly dried till perfectly "riddled" with drains. On several farms the drains are not more than from twelve to fourteen feet apart, and still all their "drawing" powers are taxed to the uttermost. In the early days of draining, stones were used exclusively, and are so still when they can be had conveniently. It is very seldom, however, that they can be obtained, and in a large majority of cases tiles are substituted. The average depth of drains is about four feet, and the cost from 3s. to 4s. 6d. per chain. On some farms the soil is so extremely soft and free of stones that no pick is required in cutting the drains, and of course in these cases the cost is a little less. The beneficial effect which superior drainage has had on the soil of Fifeshire has been inestimable. Drainage, in fact, has changed much of it from being perfectly useless to valuable arable land. A large amount of Government money has been expended on draining in the county.

Grain Crops.

Fifeshire is an extensive grain-producing county. In fact, as already stated, the great aim of its farmers is to produce the best

possible corn crops. Their whole efforts are directed towards that end; their system of cultivation and general management are arranged to suit it; and hence, the return from grain must necessarily be regarded as the principal item of revenue. The fertility and richness of the soil and mildness of climate fit the county specially for the producing of grain of all kinds; and the advantages provided by nature are fully taken advantage of. In speaking of farming customs generally we referred to the prominence given to grain in the system of rotation which obtains in most parts of the county, and therefore it would be needless to enlarge on the subject here. On an average year the grain crop throughout the county is invariably an excellent one, very heavy, rich, and of the best quality, the yield and weight being at least equal to that in almost any other county in Scotland. In colour the grain is generally magnificent, while with respect to form and soundness it is all that could be desired. It is very seldom indeed that much damage is caused to the grain during harvest, though in such years as rainy '72 a good deal of loss is inevitable. The springs, generally speaking, are open and dry, and farming operations proceed without many stoppages. A large proportion of the land intended for cropping is ploughed in autumn or winter, and hence the pressure of work in spring is not so great as in most other counties. Such a very large breadth, however, is put under grain, that seed time must of necessity be a period of great anxiety to the farmers of the county. Fortunately, the weather seldom interferes very seriously, and the seed is generally deposited in a dry, well-prepared bed, a desideratum of the very first importance. Sowing machines are used exclusively on all the large and many of the small farms—on several holdings in fact not exceeding 50 acres. The land suits the machines well, and they are found to be a most valuable invention. Both drill and broadcast machines are in use in the county, but the former seem to predominate. No labour is spared in preparing the land thoroughly for the seed; while it is equally as well done to after it has received it. Harvest operations generally commence about the end of the third week of August, and seldom extend over much more than a month. In the later districts the grain of course does not ripen so quickly as in the better favoured parts, and here cutting is seldom begun till about the end of August. Machinery is employed still more exclusively in the reaping than in the sowing. In fact, the crop may be said to be entirely reaped by machines; and, considering the superior character of the work done by the reapers compared with that executed by the now old-fashioned scythe, no surprise need be entertained that it should be so. On many of the larger farms two and sometimes three reapers are kept going at once, and in this way many large fields are often

turned into stooks in a marvellously short time. A good many self-delivery machines are employed, but the manual deliveries are by far the most numerous. Strange to say, the scythe was never generally adopted in the county of Fife, almost the whole of the grain having been reaped by the antiquated "hook" till some ten years ago, when reaping machines were introduced. Some farmers let the cutting of their crop to "thravers," while others engaged shearers and superintended the work themselves. The crop was generally very carefully reaped in this way, but the system was a painfully slow one, and it was abolished not a day too soon. The scythe was employed on several farms for a few years, and is used yet on a few small holdings. Scythes are used in preparing the fields for the reapers, and in cutting out-of-the-way corners. The gathering in of the grain is a work of the greatest importance, and all available hands are employed in it. The stacks are generally large and carefully built and dressed up, many of the stackyards being finished and "done up" in a most tasteful manner. A good deal of the grain is thrashed out early in the season, and is thus in readiness for the market when prices are most inviting. The top quotations are invariably obtained for the Fifeshire grain, the fiars prices being generally from 1s. to 2s. per quarter above those in the northern counties of Scotland.

Wheat.—This fine variety of grain is very extensively grown in Fifeshire. The acreage under wheat was in—

1856, . .	34,099½	1870, . .	20,021
1857, . .	29,340¼	1873, . .	16,759
1868, . .	20,461	1874, . .	17,490
1869, . .	21,433	1875, . .	16,748

Decrease since 1856, . . 17,351½.

The acreage annually put under wheat in Scotland has been gradually decreasing during the past twenty years, and in this falling off Fifeshire has had its full share. It will be seen that since 1856 the breadth put under wheat in Fifeshire has become less by more than one-half—a most marvellous decrease in such a short period. The reasons for this change have been various, the most effective perhaps being the recent low prices for wheat and the comparatively high prices for other varieties of grain. A slight waving up or down, however, of the breadth put under wheat in Scotland, need not be viewed with very great apprehension, seeing that the whole wheat produce of the kingdom is but as a drop in the bucket compared to the consumption of wheat in Europe; it is equal to little more than one day's consumpt! Though the decrease has been large, Fifeshire yet stands at the top of the list in Scotland as a wheat-producing county. It exceeds the next highest counties by upwards of 4000 acres, these counties being Forfar and Perth, Haddington coming fourth, with

10,470 acres. A few years ago a considerable quantity of wheat was sown in spring, but now it is almost wholly put into the ground as soon as practicable after the harvest. In autumn and early winter from 2 to 4 bushels of seed are given to the Scots acre, and in spring sometimes as much as five bushels. The yield along the coast ranges from 4 to 6½ quarters per imperial acre, and inland from 3½ to 5½ quarters. The weight varies from 60 lbs. to 63 lbs. per bushel, while the quality is invariably good. Wheat is the third crop in the rotation, and is grown either after potatoes or beans, principally the former. The soil and climate of Fife suit wheat admirably, and as fine samples of white wheat are grown in the county as could be produced anywhere else in the kingdom. The roots of wheat are of a piercing character, and the plant requires the very best of nourishment, and coming, as it invariably does, after potatoes—another greedy crop—the land is generally in a low manurial state by the time it is cleared for the fourth or turnip crop. The favourite variety is white wheat, the red variety being now grown a little less extensively than some years ago.

Barley.—Taking the average of a number of years, barley is perhaps of all varieties of grain the most remunerative to the farmer. It is not by any means an expensive crop, and usually produces a large return, while in the market it invariably finds a ready sale. No wonder then that its cultivation has of late been gradually on the increase. The acreage under barley in Fifeshire was in—

1856, . .	22,856	1870, . .	28,053
1857, . .	26,670	1873, . .	30,502
1868, . .	25,338	1874, . .	29,393
1869, . .	25,935	1875, . .	30,037

Increase since 1856, . . 7181.

The counties of Fife and Forfar stand on a level with respect to the annual breadth under barley. There is generally less than 100 acres of difference between the two, Fife being highest the one year, and perhaps Forfar the next. These two stand a long way a-head of all the other Scotch counties, Berwick and Perth, the two next highest being upwards of 6000 acres behind. Large, however, as has been the increase in the cultivation of barley in Fifeshire, it is scarcely equal to one-half the decrease in the acreage of wheat. Barley, the fifth crop in the rotation, is grown on the field after turnips, and of course has the benefit of the manure unexhausted by the roots. A fine friable medium loam, such as exists in many parts of Fifeshire, is best adapted for the growth of barley; and, though to produce a good crop land must be in a high manurial state, it is not nearly so trying on the soil as wheat. Its roots are very unlike those of wheat. Instead of piercing they spread laterally, and absorb nourishment from the surface. A good many farmers eat off part of their

turnips by sheep, and find that the system is specially advantageous to the cultivation of barley. The sharp stimulating manure left on the land by the sheep is easily within the range of the barley roots, and is found to have a most beneficial effect on the crop. On the richer soils along the coast, the yield varies from 5 to 8 quarters, and in the inland parts from 4 to 5½ quarters per acre. The weight per bushel ranges from 54 lbs. to 57 lbs. The quality and colour of the grain are invariably very fine. Chevalier is by far the most popular variety, and is grown on almost every farm. From 2 to 3½ bushels of seed are given to the acre.

Oats.—The acreage under oats in Fifeshire was in—

1856, . .	42,327¾	1870, . .	38,574
1857,. . .	42,219	1873, . .	39,242
1868, . .	40,103	1874, . .	38,035
1869, . .	39,274	1875, . .	37,646

Decrease, since 1856, . . 4681¾.

It will thus be seen that oats, like wheat, is gradually lessening a little in importance in the programme of the Fifeshire farmer. Since 1873 there has been a yearly decrease of about 100 acres in the acreage sown with this hardy variety. Fifeshire stands eighth in Scotland as an oat-producing county, and is closely followed by several others. Aberdeenshire has about five times its breadth under oats, and Perth nearly twice; while Banff, Forfar, and Ayr exceed it by upwards of 12,000 acres. But, though behind several others in point of acreage, Fifeshire will compare with almost any other county in Scotland with respect to the yield or value of the crop. All over the county the oat-crop is generally a very fine one, heavy, equal, and very rich. An excellent return is usually afforded, and the quality of the grain is the very finest to be had anywhere. In fact, the best grain crops we have ever seen growing were along the sea-board of Fifeshire. A few fields on the east coast this year were, to say the least, magnificent. When cut, the stooks were most marvellously thick and tall; the "heads" of the grain being very unusually rich; while the straw was of the very best quality. Oats may be called the first crop in the rotation, and are always grown after lea. The lea land, or as much of it as possible, is ploughed during winter, and being exposed to the ameliorating influences of the frost and wintry atmosphere, yields more easily to the harrows than if left untouched till spring. It is of very great importance for the cultivation of oats, as indeed for all kinds of grain, that a good tilth be obtained, and, generally speaking, no trouble is spared in Fifeshire in harrowing the land thoroughly. When grain of any description is grown for a number of successive years on the same farm, it deteriorates very considerably in quality and productiveness, but the Fifeshire farmers are careful to change their seed frequently, and thereby they

escape damage in this way. Large quantities of seed are taken from England and the Lothians, and some from the north of Scotland. Oats from the latter region do very well indeed. On the richer soils the yield per acre ranges from 6 to 9 quarters, and on the moderate land from 4½ to 7 quarters. The weight per bushel varies from 41 lbs. to 44 lbs, and would probably average about 42 lbs. Potato oats are grown very extensively, and suit the rich land admirably. On the higher and poorer soils, Sandy, Early Angus, English Birley are generally preferred; while a very fine variety called the Hopetoun oats is also sown on many farms. The quantity of seed given to the acre varies from 4 to 6 bushels; the difference of opinion as to the advantages of thick and thin sowing being very great. A considerable quantity of seed is saved by the use of sowing machines.

Rye, Beans, and Peas.—Since 1856 the acreage under rye has increased from 678 to 1304 acres. It usually affords a very fair return and is used chiefly for feeding. Beans grow exceedingly well on the heavy land, and it seems a little surprising that they are not cultivated more extensively than they are. In 1856 the breadth under beans was 3602 acres, and this year it was 2483 acres. Part of the second field in the rotation is usually put under beans, and we are pretty certain that they afford equally as good a return as potatoes. They are sown both in drills and broadcast; and are sometimes mixed with peas and tares. In 1856 there were 456 acres under peas, but this year there were only 109 acres, and this breadth was made up chiefly of numerous small patches.

Since 1856 the total acreage under corn crops has decreased by no less than 15,693 acres, the figures being—

1856, . .	104,020	1875, . .	88,327
Decrease, . . .		15,693	

Hay and Grass.—It has already been stated that very little hay or grass is grown. The acreage was in—

1856, . .	65,898	1870, . .	56,187
1857, . .	65,593	1873, . .	53,367
1868, . .	53,627	1874, . .	54,811
1869, . .	51,394	1875, . .	56,430
Decrease since 1856, . .		9468	

It will thus be seen that the breadth under hay and sown grass, as well as under wheat and oats, has decreased considerably during the past twenty years. With respect to acreage of grasses under rotation, Fifeshire stands tenth in Scotland, and is very much exceeded by every other county with an equal breadth of arable land. The introduction of the six-shift rotation confines the grass acreage within narrow bounds, and so long as it continues to obtain, of course the cultivation of grass cannot be

much extended. In seventeen counties in Scotland the area annually under hay or sown grass is equal to, or exceeds the total acreage under corn crops, while in Fifeshire the area under hay and grass falls short of that under corn crops by 31,897 acres. This shows most strikingly the marvellously small amount of grass that is grown in the county of Fife. On almost every farm worked on six shifts, more than one-half of the field sown with grass seeds is retained as hay, and is thus available as pasture only after the hay is stacked. And even then much of it is not used as pasture, a second crop being taken in many cases for food to animals in the house. Of the 56,430 acres sown with grass seeds, upwards of 24,500 acres are kept as hay, thus leaving less than 32,000 acres as pasture grass. Very fine crops of hay are grown; and considering the exhausted state which most of the land must be in before it reaches the sixth shift, it is most surprising that they should be so very superior. No better testimony of the natural richness of the Fifeshire soil could be adduced, than the excellent crops of hay it produces at the end of such a trying system of rotation as that which obtains in the greater portion of the county. And not only does it afford an excellent crop of hay, but an aftermath or "second crop," which we have not seen equalled for weight and quality in any part of Scotland. When pastured, the grass stands out admirably well, and is of the finest quality. Where two years' grass is taken, the covering of the second year is on the whole very good, in some cases very excellent. It is held by a good many of the Fifeshire farmers that the heavier and stronger soils of the county are not adapted for grass, and won't grow it satisfactorily for two successive years. We do not doubt there is some ground for this argument in a few cases; but we are clearly of opinion that careful preparation would obviate much of the difficulty. We think that if the land were sown out in good heart and well limed,—much of the soil of the county would be none the worse for a good dose of lime,—grass would grow at least moderately well for two successive years. Perhaps of all the different kinds of farm crops, none tests the manurial condition of the soil better than a two or three years' succession of grass. Unless the land is in good heart, and well cleaned and cultivated when sown out, it cannot be expected that a rich covering of grass would continue for a succession of years; and it must be admitted that much of the Fifeshire land is sown out in only a moderately rich manurial state. We have already given it as our opinion that it would be highly profitable to the Fifeshire farmers to adopt the seven-shift system of rotation in place of the present six shifts, and we have every confidence that before many years have past a good many will have introduced the change. In fact, a number have already done it, and

so satisfied is one large farmer (whose farm is rented at about L.3 an acre) with the advantages of the system, and the grass-producing properties of his land, that he contemplates changing into eight shifts, taking three years' grass instead of two.

The land is sown out with the barley crop, the grass seeds being sown by some farmers along with the grain, and by others a few days afterwards. In some cases the land is rolled before the seeds are sown, and when the seeds have been committed to the soil, the land is harrowed with chain harrows and rolled again. This system, though not pursued by many, is a most satisfactory one. It would be very difficult to give any indication of what is the most universally used mixture of grass and clover seeds. Different soils need different mixtures, and the views of farmers on the subject are very varied in this, as in every other county in the kingdom. It is seldom that less than 16 lbs. or more than 20 lbs. of ryegrass, with about 8 lbs. of clover seeds—red and white—are sown to the acre. When intended for hay a small proportion of cow grass is added. The few grass parks which are annually let in the inland and higher lying parts of the county usually realise from L.1 to L.4 per acre.

Root Crops.

Turnips.—The turnip crop is a very valuable one. It is very carefully cultivated, and grows exceedingly well. The number of acres under turnips was in—

1856, . .	29,739¼	1870, . .	28,951
1857, . .	30,645½	1873, . .	30,010
1868, . .	27,972	1874, . .	28,839
1869, . .	28,375	1875, . .	28,514

It will thus be seen that the breadth put under turnips has neither decreased nor increased to any appreciable extent during the past twenty years. A quarter of a century ago only a very few swedes were grown, but now more than one-half of the whole turnip break is sown with this valuable variety. Farmers find that they are much preferable to any other kind of turnips for feeding purposes, and though they require heavier manuring, yet they are more profitable than yellows. This latter variety, however, affords a heavy yield, and suit young stock well; while they are found to be well adapted for beginning feeders. In most of the northern counties in Scotland, where grain is not so largely cultivated as in Fifeshire, the turnip crop is often the most profitable crop of the rotation, and though it does not rank so comparatively high in value in this county, yet it is a very important crop. The turnip break is the fourth in the rotation. As soon as the land is cleared of wheat and the harvest can be finished, the stubble fields are ploughed, and ploughed most thoroughly they are, the furrow varying in depth

from nine to ten, and sometimes twelve inches. When the land is steep it is ploughed downhill only, and turned over to the depth of about a foot. Scarifying has been tried on a few farms, but was not approved of, and has never been very largely pursued. The turnip land is sometimes grubbed or cross ploughed during winter, but this is done only when it is very rank with weeds. The Fifeshire soil is not very apt to become overrun by weeds, yet a few have to be extirpated every rotation. The majority of the farmers gather the weeds and drive them off the land, while others "shake" them well and turn them into the bottom of the drills. The turnip land being exposed to the frost of the winter is usually well pulverised, and is very easily cultivated. It is very important for turnips, as well as for grain, that a fine tilth be obtained, and the farmers of Fife bestow an immense deal of labour in securing this. Coming as the turnip crop does after wheat and potatoes, it necessarily finds the land in a very exhausted condition, and hence a liberal supply of manure must be applied. The Fifeshire farmers, however, manure with no niggard hand. They deal it out most liberally, and are invariably most amply repaid for their outlay. For swedes about 20 tons of farm-yard manure, with from 5 to 8 cwt. of guano or bones—dissolved or in dust—are usually given to the acre; while for yellows, the dose consists of from 15 to 18 tons of farm-yard manure, and from 2 to 4 cwt. of guano or bones per acre. When sea-weed can be obtained it is applied instead of farm-yard manure, and it is found to suit admirably. On a few farms more of both artificial and farm-yard manure is allowed to the acre, and the extra outlay is generally fully repaid by an extra heavy yield. Swedes are mostly all sown before the end of May, but a large portion of the yellows are sown in June. The greater part of the land is often ready for the seed early in May, but it is found to be very unprofitable to sow too soon. The yield of turnips in the county is very high, often as much as 35 tons of yellows and 30 tons of swedes being grown on each acre. The average per acre is very much below these figures—seldom much above 18 tons; but still, the county usually stands about thirteenth in Scotland with regard to the yield of turnips per acre. The quality of the Fifeshire turnips is also excellent, and they are regarded as being very well adapted for feeding. The turnips are stored on the land or driven home to the farm-steadings during winter, and are thus saved from the frosts of winter. Storing operations, however, are seldom commenced till about the middle of November, as the roots generally continue to grow till that time. Turnips do not make much progress in Fife early in the season, and were a stranger to visit the county in the months of July or August, he would be most unfavourably impressed with the appearance of the turnip crop. An immense

improvement, however, takes place after the end of August. The bulbs expand most marvellously, and many fields that seem sickly and stinted at the close of summer turn out to be rich and very heavy. A large quantity of the seed used is grown in the county.

Potatoes.—Fifeshire has long been famous as a potato-producing county. It has always cultivated them extensively, and of late years has been giving a little more prominence to them than ever. The acreage under potatoes was in—

1856, . . .	17,269	1870, . . .	19,523
1857, . . .	16,349½	1873, . . .	17,339
1868, . . .	17,519	1874, . . .	17,180
1869, . . .	18,566	1875, . . .	17,746

The increase since 1856, it will be seen, is not very large, but then the county stood third highest in Scotland with regard to the proportionate acreage under potatoes compared with other crops. As already stated, the high prices which were being paid for this esculent during the Crimean war increased its cultivation in Fife, as in several other Scotch counties, and since then it has never been abandoned, though these high rates have long ago ceased to exist. The soil and climate of Fife suit the cultivation of potatoes admirably, and yet the county stands only about twentieth in Scotland with respect to the produce of potatoes per acre. We have already expressed our opinion against the extensive cultivation of potatoes, and stated our reasons for doing so, which it would be needless to repeat. Suffice it to say that the crop, taking an average of a rotation, is not a paying one, and therefore it ought to be abandoned. It has got a firm hold in the county of Fife however, and will not likely be given up for some time to come. Potatoes are the second crop in the rotation, coming after oats. The potato land, at least in the heavier soils, is invariably manured on the stubble with from 18 to 22 tons of farm-yard manure per acre, and ploughed as deeply as possible in autumn or early winter, getting from 3 to 5 cwt. per acre of guano and dissolved bones at the time of planting. The advantages of autumn manuring are found to be very important, and when a good doze of artificial manure is applied along with the seed the plants come away beautifully. It is very seldom that disease does much damage; and in general the crop is a pretty even one. The yield per acre ranges from 5 to 8 tons, and in a very fine year, and when the land is well done to, sometimes 9 tons are obtained. The dressing operation, however, reduces the return available for the market, all the small potatoes being turned aside as food for cattle and for sale to the starch works. Regents and blues prevail, but several other varieties are grown to a small extent. Part of the potato crop is planted before and part after the

sowing of the grain seed, and is lifted immediately on the conclusion of the harvesting operations. The lifting process is a tedious and precarious one, and necessitates a considerable outlay, so many labourers being required.

Other Green Crops.—Between twenty and thirty acres of mangold is grown every year, while carrots occupy a similar breadth. Both these varieties of roots grow well, and would pay more extensive cultivation. Mr Bethune of Blebo had a return of close on L.40 per acre for a small field of carrots in 1874. The crop is somewhat risky. It sometimes grows exceedingly well one year and fails almost entirely the next. This, however, may be partly owing to the limited acquaintance which most farmers have of the best modes of cultivating it. About 100 acres are generally put under cabbage, kohl-rabi, and rape, and upwards of 1000 acres under vetches. Vetches grow luxuriantly, and are very valuable as a commencement to cattle intended for feeding.

The county of Fife stands second in Scotland with respect to the percentage of its acreage under green crops. The total number of acres under root crops and fallow was in—

1856, . . .	46,129	1875, . . .	47,460
1869, . . .	48,051	Increase, .	1,341

Live Stock.

Cattle.—As already stated, a most marvellously small number of cattle are reared in the county of Fife, though a good many are prepared for the butcher. The number of cattle in the county was in—

1856, . . .	40,611	1870, . . .	35,949
1857, . . .	38,666	1873, . . .	39,013
1868, . . .	35,674	1874, . . .	40,847
1869, . . .	36,986	1875, . . .	39,540

These figures show very little variance during the past twenty years. The number returned this year (1875) is slightly less than in 1856, but last year the figures given exceed those of any previous year since the first issue of the Board of Trade Returns from which our statistics are selected. Were the Board of Trade Returns taken up in summer instead of in spring, the number of cattle in Fife would be found to be less at least by two-thirds; and, on the other hand, if they were taken up in January or February, the return would be considerably larger than it usually is. A very large number of cattle are kept in the county during winter, and of these a good many are disposed of in the months of January, February, and March, and thus not included in the returns. But in the summer months the stock of cattle is very

small indeed, consisting mainly of cows and young cattle. The total number of cows and heifers in milk or in calf in this year's returns is 8494 (or about 1000 less than in 1856), and the number under two years of age 16,768, the remainder, 14,278, being above two years. Fifeshire stands thirteenth in Scotland with respect to the total number of cattle of all kinds, and seventeenth with regard to the number of cows in Scotland—Aberdeen and Ayr have upwards of five times as many cows as Fife; Lanark has four times as many; Argyle and Perth nearly three times; and Dumfries, Inverness, Ross, and Wigtown fully twice as many. This shows what has been already stated, that Fifeshire's strength—and unusual strength it is—lies elsewhere than in its live stock. There are in fact only a very few breeding stocks in the county, the 8494 cows being made up chiefly by small lots which must necessarily be kept at every farm to supply the residents with milk. Some of the larger farmers keep fifteen or perhaps twenty cows, but by far the majority retain only as many as will afford a sufficient supply of milk. The calves of these few cows are generally reared and fed off as two-year olds; but so strong is the dislike which several Fifeshire farmers have to the rearing of young stock that they dispose of their few calves as soon as ever they are in a fit state to be removed. This undoubtedly saves a good deal of trouble, but the system we confess seems a slightly strange one. With so very few cows, and with such a large breadth of turnips to be consumed, it becomes incumbent upon the Fifeshire farmers to appeal to the markets for a large stock of wintering cattle. The number of cattle bought into the county of Fife every year is enormously large, larger in fact than in any other county in Scotland. The number of calves reared in the county cannot be laid down at more than 8000; and when it is mentioned that upwards of 22,000 acres of turnips are consumed by cattle every year, some idea will be had of the number of cattle that must necessarily be introduced. The greater number of these animals is bought in when yearlings, a small proportion being introduced when about two years old. By far the majority are Irish bred cattle; and we cannot help remarking that this is one of the few phases in the agriculture of Fifeshire with which we do not entirely coincide. A large number of very good animals are brought over to us from the Emerald Isle, animals that very often yield their feeders handsome profits, but, on the other hand, a very considerable percentage is of an inferior character. We have seen a few Irish cattle that were carefully treated from their youth upwards (which many of them are not) bring a good deal more money when fully ripe than the average price for home-bred cattle of the same age; and lately we handled a very fine lot of three-year old Irish oxen, which have been moderately fed

for nearly two years, and for which their owner—a large farmer in Ross-shire—refused the handsome figure of L.38 a-head in the month of March last. But these are only exceptions. In Fifeshire, as in every other county in Scotland, home-bred cattle are as a rule found to give the best account of the good things bestowed on them, and to afford the largest return for their winter's keep. And we do not doubt but home-bred cattle would be bought by all the Fifeshire farmers were it easy or possible to obtain them. But when such a large number is required this is scarcely possible, and hence resort must be had to the large droves of Irish cattle that are brought into the Fifeshire markets, especially in the months of August, September, and October. The markets of these months are invariably very largely made up of Irish cattle; often, in fact, entirely. One very much to be deplored result of such a large import of Irish cattle is, that the county is constantly kept in a mess of foot-and-mouth disease, and often also with pleuro-pneumonia. The loss that is frequently sustained by these maladies is very heavy, and in many cases absorbs nearly the profit that can be had after the animals are wintered. August and September are the principal months for buying in the winter's stock, and at that time from L.16 to L.18 a-head is the price usually paid for yearlings. The animals are very liberally fed during winter with turnips (yellows generally at the onset and swedes latterly) and cake, and are sold in prime condition in the spring at from L.26 to L.32 a-head. The oldest and best thriving lots are generally sold in the months of January and February, a few even in December, many of the younger and stiffer beasts remaining in the feeding-stalls till the June markets. A number of farmers introduce as many as possible of the winter stock from the neighbouring counties,—Perthshire especially,—and these animals invariably afford the largest return for their keep, excepting perhaps the few reared by the farmers themselves.

The few cows that are kept in the county are of various breeds, the majority being crosses of a somewhat obscure origin. The bulls used are almost all shorthorns, and are generally of very fair merit, a few of them being very good. With the view of improving their breed of cattle, a few of those farmers who keep a small breeding stock have recently been experimenting with crosses between Galloway cows and shorthorn bulls. Mr Cunningham, Dallachy, bought a few Galloway heifers some time ago, and has been rearing excellent calves between them and a superior shorthorn bull; while Mr Dingwall, Ramornie, has been breeding from pure Galloway cows and first crosses from Galloways and shorthorn bulls for a few years. This system is not by any means a bad one, and the efforts of these and other gentlemen to improve the native breed of cattle deserve the

highest commendation. A much more profitable system, however, would be to rear from polled Angus cows and shorthorn bulls. The beef markets of every successive year convince us more and more strongly that the most profitable "commercial" cattle beast that can be produced is a cross between a polled Angus cow and a shorthorn bull. The size of frame and early maturing qualities of the shorthorn bull, when judiciously blended with the hardy constitution and rich quality of beef of the Angus cow, form an animal which for general commercial purposes could scarcely be surpassed. The cows between Galloways and shorthorns have also much to recommend them, but they generally partake a little too largely of the somewhat coarse and buffalo characteristics of the ancient Galloway. Angus cows are conspicuous by their absence in the south of Scotland, but they are abundant in the northern counties. To introduce Angus cows would entail a considerably heavier outlay than the buying of Galloways; but we are convinced that the difference in the price is not nearly equal to the advantages that would be derived from breeding from Angus instead of Galloway cows. In the north-eastern counties of Scotland, where the Angus breed has had its headquarters for so long a period, the system of cattle-breeding which we have recommended is pursued very largely, and is found to be most profitable and satisfactory.

An ancient account of the agriculture of Fifeshire says that the county "has long been distinguished for the excellence of its herd of cattle. The prevailing colour is black, though in the true county breed great variety of colour prevails; they are hardy, fleet, travel well, are tame, good feeders, and fatten quickly." The date or authorship of this report we have failed to discover; but, nevertheless, it was the case that in "the good old days" of the past century Fifeshire enjoyed a well-deserved fame for its black cattle. All these have long ago disappeared, however, and now the few cattle that are kept are of a very different stamp. Fifeshire has never had great pretences in the way of rearing fine bred cattle. A few have all along been bred in the county, but the system never obtained great popularity among the farmers. The name of the county, however, is very closely connected with the history of shorthorns on this side the Tweed, on account of its having at one time boasted of one of the best shorthorn herds in the kingdom—the late Keavil herd, bred by Mr G. R. Barclay. This famous stock, managed for several years so carefully and well by Mr Easton, took a very prominent position in its day. It was dispersed in September 1869, and its members and their descendants are spread all over the country, commanding notice and admiration wherever they appear. The Seraphinas of Keavil have long

been well known as a very fine race of shorthorns. At the dispersion sale the fine old cow "Seraphina 13th," by the noted bull "John O'Gaunt," fetched 110 guineas. This famous animal was brought to Keavil when a three-year-old at a cost of 240 guineas, and that the investment was a profitable one is amply testified by the fact, that at the sale in 1869, two of her daughters —"Seraphina Carissinia," a very fine two-year old heifer, and "Booth's Seraphina," a splendid yearling—brought 120 and 150 guineas respectively; while her son, "Heir of Englishman," fetched 100 guineas. This fine bull—the winner of the second prize in the young class at the Highland and Agricultural Society's Show at Glasgow in 1867, the first at the same show in Aberdeen in 1868, and the fourth at the Royal English Show in 1869—was purchased by Mr Marr, Uppermill, Tarves, Aberdeenshire, and has left a most valuable stamp on the well-known herd at Uppermill. The cow and her two daughters were taken to England by Lord Sudley, and have long ago repaid his lordship for his outlay. Lord Sudley's beautiful heifer "Seraphina Bella 2d," which got first royal honours as a calf at Hull in 1873, and for which 500 guineas were then refused, was bred from them, as also was a very fine young bull which Mr Marr, Uppermill, purchased last spring from his lordship at 200 guineas; and several highly-priced heifers which have recently been shipped to America. "Booth's Seraphina" had the first prize as a yearling heifer at the Highland and Agricultural Society's Show at Edinburgh in 1869, while Mr Barclay was first and third for yearling bulls at the same show at Aberdeen in 1868, the first prize one falling into the hands of Mr Godsman, Mains of Federate, New Deer, and the third one going to Gordon Castle. The highest priced animal at the dispersion sale in 1869 was "Fan Fan," a highly bred cow which was taken out by Mr White of Clinterty, Aberdeenshire, at 165 guineas, and which has left excellent stock at Clinterty. At the present day there are only five or six farmers in the county who attempt the rearing of pure shorthorns; and with the exception of Mr Bethune of Blebo, none enter into the movement very largely. Mr Bethune bred shorthorns for a number of years previous to 1865, when the rinderpest made such a deadly march through the country. In that year Mr Bethune buried twenty-six pure shorthorns, all the work of that deadly enemy. Only one or two shorthorn cows escaped; but with this small remainder he commenced breeding anew, buying in a stock bull at a sale held by Mr Mitchell, Alloa, on the 25th August 1870. This animal was "Master Blyth" 29,314, out of "Lady of the Lake," by Mr Booth's "Prince Arthur." At the same sale Mr Bethune bought a fine red cow, "Bessy Bell," after "Lord Eagle," and out of "Blue Bell," by "Knight Errant,"

18,154. Fortunately this fine cow's first calf at Blebo was a heifer one, the sire being "Baron Booth." At the Costerton sale on 18th May 1869, Mr Bethune bought "Ramping Girl," a very fine cow that has been the winner of many show-yard honours. "Ramping Girl" was got by "Enoch Arden," 23,890, and out of "Brown Girl," by the famous "Duke of Tyne." "Master Blyth" is still in the herd, and though six years of age, is still a useful stock bull. These two cows bought in had two or three very good heifer calves sired by "Waterman" and "Master Blyth." A representative of one of the cows that survived the rinderpest is still at Blebo, a rich roan cow of very fine quality. That cow was "Dewdrop," out of "Lady Havelock," a fine cow bought from Mr Unthank, Netherscales, and after an almost pure Booth bull named "Autumnus," 27,902. The latest, and perhaps the most important addition of all, was the purchase of "Floggathrope" at the dispersion, on the 1st September last, of the fine herd belonging to the representatives of the late Mr William Torr, Aylesby, Lincolnshire. "Floggathrope" is four years of age, is fine in the bone, shapely, and of very excellent style and quality, and was very cheap at 225 guineas. Her condition at the time of the sale was a little doubtful, else she would have given a great deal more money. She was brought home safely to her comfortable quarters in Fifeshire the very day we happened to visit Blebo. She looked none the worse for her long journey, and will doubtlessly prove a valuable addition to the already good herd, of which she is now a member. It is not very large nor of great showyard pretences, but it is healthy and prolific, and of very considerable merit, and is kept most carefully by Mr Bethune. Mr Reid, Cruivie—a highly-experienced, careful farmer—has also a small herd. He has kept a few shorthorn cows for about ten years, and has all along bred from bulls with a large share of Booth blood. His herd now numbers about twenty animals, and is of very fair merit. A few moderately good shorthorn bulls are reared at the Home Farm of Balbirnie, and sold at fair prices among the tenants on Mr Balfour's estate. About twenty pure cows are kept, the last stock bull introduced having been bought four years ago from the Duke of Buccleuch at the handsome figure of 100 guineas. Mr Tod, Bracklay, has also a few good shorthorns.

While the shorthorn ranks are not by any means strong, those of polled Angus cattle are still weaker. In fact, there is only one herd of the latter in the county, that belongs to Mr Leslie Melville Cartwright of Melville. This thriving herd, so well and carefully managed by Mr Andrews, factor on the Melville estate, was started in 1871, Mr Cartwright having in that year bought "Lavender," bred by the Earl of Southesk; "Bracelet," bred by Mr M'Combie, M.P., of Tillyfour; "Mina," bred by Colonel

Fraser, Castle Fraser; "Topsy," bred by Mr James Leslie, Thorn; "Old Farnell," bred by Mr Leslie; "Young Lavender," bred by Mr Leslie; "Young Bracelet," bred by Mr Leslie; and "Colonel of Castle Fraser," all from the dispersion sale of Mr Leslie, Thorn. "Colonel of Castle Fraser" was out of "Mina," and was thus descended from the excellent polled herd so carefully superintended at Castle Fraser by Mr Hampton. He was a bull of very great merit indeed, and was first at the Highland and Agricultural Shows both at Kelso and Stirling, besides having won many local show-yard honours. "Mina" was also well known as an extensive prize-taker. She was first as one of a pair of heifers at the Royal Northern Society's Show at Aberdeen in 1864; first as one of a pair of cows at the same show in 1865; first at the same show in the single cow class in 1867, carrying also the challenge cup as the best polled animal in the yard, and first at the Highland Society's Show at Glasgow in 1867, besides winning numerous local honours. Mr Cartwright has still one of her daughters, a neat shapely cow of four years. In 1873 "Ruth," bred by Mr Scott, East Tulloch, Stonehaven, and after the Earl of Southesk's "Theodore," 393; and "Victoria 6th," bred by Mr Bowie, Mains of Kelly, Arbroath, and after "Jim Crow 4th" were introduced. At the dispersion of the famous herd of the late Mr George Brown, Westertown, Fochabers, in September 1874, Mr Cartwright bought "Maggie," bred at Westertown, and after "Success;" "Mary," also bred at Westertown, and got by "Captain;" and "Dandy," bred at Tillyfour, and after "Rob Roy." At present the herd numbers twenty-three very good animals, and is in excellent breeding condition. The best cows are "Mina 2d," "Bracelet 2d," "Victoria 6th," and "Young Topsy," the latter being a very fine two-year old heifer. There are a few very good yearling heifers, the gem of the lot being "Lily," out of "Victoria 6th," and after "Gainsborough," the gold medal bull at Glasgow last July. There are also a few very fine bull calves, the best one being out of "Mary," and after "Duke of Perth," the fine bull bred by the late Mr Brown, and now in the possession of the Marquis of Huntly, that was first in the aged bull class at the Highland and Agricultural Society's Show this year. The herd is not by any means over-fed, but is kept in a sound, healthy, thriving condition.

Sheep Farming.

Sheep farming is pursued only to a limited extent, and considering that the county is so well adapted in every way for the fleecy tribe, it is a little surprising that it is not much more extensively followed. The genial climate, and dry, rich soil of the county fit it specially for the rearing and feeding of sheep; and at any rate, feeding might be extensively adopted with highly

beneficial results. The total number of sheep in the county was, in

1856, . . .	57,306	1870, . . .	54,846
1857, . . .	56,028	1873, . . .	74,448
1868, . . .	73,177	1874, . . .	80,411
1869, . . .	61,135	1875, . . .	69,609

Increase since 1856, . . 12,303.

It will thus be seen that there has been a slight increase during the past twenty years, though the number returned this year is less than in 1874 by nearly 11,000. A very small proportion—only about one-fifth—of the flock kept is for breeding purposes. The number of lambs annually raised in the county seldom exceeds 14,000 or 15,000, and thus a great many sheep must be bought in. The prevailing custom is to buy in half or three-parts bred hoggs, chiefly from the St Boswells and Melrose districts and Perthshire, about the end of autumn, and feed them on turnips and cake or turnips and grain during the winter, selling them off in spring. The prices paid for these hoggs vary so much that it would be difficult to state an average figure. Often as much as 50s. a-head, and sometimes more, is obtained in the spring market. The majority of the farmers feed off; but a few obey the dictates of the markets, and sell lean, or retain and fatten, according to whichever system is likely to suit the demand best. With a good many farmers the plan of feeding is to drive the turnips on to the lea fields, and there cut them and give them to the hoggs in troughs or on the land. A great breadth, however, of turnips is eaten off the root; and, except in an unusually wet season, this can be done most satisfactorily. The turnips to be eaten off by sheep are invariably "stripped," generally one-half and sometimes two-thirds being pulled for the cattle; and thus a greater breadth of land gets the benefit of the sheep's manure. When any portion of the turnip break happens to be manured with artificial manure only, farmers are careful to eat off the turnips on this portion by sheep, so that the want of the more substantial farm-yard manure may be compensated for by the droppings of the sheep. The advantages accruing to land by the feeding of sheep upon it, especially when they are fed on swedes, are well known to be very important; and when the fattening of sheep is usually so remunerative a speculation, we think it would be highly profitable for the farmers of Fife to keep a much larger number of sheep than they do. Of course, while so little land is left under grass, the number must necessarily be limited; but were two years' grass taken instead of one, four or five times the present number might be kept with great advantage. The want of fences is also much against the successful rearing and feeding of sheep; but this, we doubt not, is a drawback that ere long will be entirely swept away. By far

the majority of the sheep kept in the county are hoggs—crosses between Cheviot ewes and Leicester tups—perhaps as profitable a class of sheep as is to be found anywhere in the British islands. In the west and higher lying portions of the county a few black-faced flocks are reared. This hardy breed seldom affords quite so large a return as the half-breds, yet they are on the whole a sure and profitable investment. The general character of the sheep kept in the county is very good indeed. It may be mentioned, that as the Board of Trade, returns are taken in the end of June, when the minimum number of sheep are in the county, they are scarcely a fair index of the stock kept.

Horses.

The number of horses in the county was, in

1856, . . .	12,248	1870, . . .	9,369
1857, . . .	12,600	1873, . . .	9,550
1869, . . .	10,495	1874, . . .	9,699

1875, ... 9,898.

These figures show an apparent decrease in the number of horses in the county now as compared with twenty years ago. There has been no real decrease, however, the difference in figures being explained by the fact that previous to 1869 every horse beast in the county was included in the Board of Trade Returns, and that since then horses belonging to occupiers of land only have been admitted. Of the 9000 or 10,000 horses in the county, about 7500 are usually employed in agricultural work solely; the remainder being either young or unbroken or mares kept for breeding purposes. Generally speaking, the horses used in agriculture are very superior animals, strongly built and very hardy. The greater number have a strong touch of the Clydesdale in them, while a good many are pure Clydesdales or almost so. They are well fed as a rule, and worked equally as well, yet they seem always in excellent trim for their work, and are seldom seen very lean in condition. The farm horses in the county have been very much improved of late by the care that landlords and farmers exercise in the selection of stallions. Several associations have been in existence for a few years expressly for the purpose of securing good entire horses to travel in the county. They are what may be called farmers' associations, but are assisted by a number of the landlords. Liberal premiums and a fixed rate of fees are guaranteed, so much more being paid for each foal left; and on these handsome terms the associations are able to secure the services of the best horses to be had in the country. The effect is already showing itself most manifestly among the young stock of horses, and the longer the system is continued the greater the improvement will become. A great many excellent ponies are kept in the county, while there is also

a superior class of carriage and hunting horses. A few of the latter are of the very first order.

Swine.

The breeding and feeding of pigs receive much more attention now than formerly, but still they have scarcely the place they deserve on the farm. The number of pigs in Fifeshire was, in

1856,	8734	1869,	5931
1875,	6050.		

Though the number kept in the county has not increased during the past twenty years, the system of feeding and general treatment of the pigs has improved immensely. They are now well housed and carefully fed, while a good deal of pains are bestowed on breeding. The ancient breed of swine was very inferior, but of late a great improvement has been effected, chiefly by the introduction of Berkshire boars, and crossing these with the native sows. A few pure Berkshire are reared in the county, Mr Leslie Melville Cartwright having a very superior little lot at his home farm of Melville. For upwards of twenty years Mr Cartwright has bred the improved Middlesex pigs on his Northamptonshire estate, and for several years in succession carried the leading honours at the principal English fat stock shows. A few of this famous breed have been brought to Melville, but the present stock consists almost wholly of Berkshires.

The science of poultry farming is not much studied in the county. On every farm, however, a few of the feathered tribe are kept, while in some cases they are reared extensively. A few excellent collie dogs are to be found in the county.

Labour.

In no matter whatever connected with agriculture does Fifeshire show its sister counties a better example than with regard to the treatment it bestows on the labouring classes—an example which we make bold to say it would be well for the British farmers were every county in the kingdom to copy. The labour question is undoubtedly one of the very first importance, and is justly engaging the attention of our ablest and most experienced politicians. The formidable character assumed by the unfortunate misunderstanding that arose in England little more than a year ago, between a number of farmers and their employées, ought to serve as a warning of the danger that is involved in an unequitable adjustment of the relations between agricultural labourers and their masters. The superior attractions which are held out to working people by our friends across the Atlantic have, during the past few years, been draining away the very bone and sinew of the Scotch farm labourers, leaving

us with "old men, women, and boys" to cultivate our farms. That such should have been the case, we are not in the least surprised; nor would we be astonished though the tide of emigration should continue to flow uninterruptedly for some time to come, unless strenuous efforts are made to check it. True, these attractions which are offered to emigrants are too often false and cruelly misleading; but still, to men who are discontented with their present position, or who consider themselves hampered or carelessly treated at home, they sound well; and who can blame a man for honestly seeking to push his fortune in whatever region of the globe a competence seems to him to be easiest within his reach?

We are not very careful to inquire who is really to blame for the unhealthy state of matters at home; we think that not only one class, but three—landlords, farmers, and servants—are in fault. Our object is to endeavour to point out a remedy. Though efforts were commenced immediately, a considerable time would necessarily elapse before the present unsatisfactory state of matters could be entirely removed. Improvement would have to be effected in many and various ways; but we think that the key to the whole question is the erection of cottages, and the encouragement of married servants. A thorough acquaintance with the counties of Aberdeen, Banff, Moray, Nairn, and Inverness, where cottages are few and far between, and where at least 80 per cent. of the farm servants are single, and live in kitchens or "bothies;" and with Ross and Caithness, and Fife, and one or two other counties in the south of Scotland, where cottage accommodation is almost complete, and where upwards of 60 per cent. of the agricultural labourers are married and live in these cottages, enables us to judge of the advantages and disadvantages of the two systems. And we would advise all those landed proprietors who are really anxious to improve the condition of the farm labourers on their estates, and who have the means to do so, to adopt the latter system, if they have not already done it. Let them visit the county of Fife, and carefully examine the state of matters there, and we feel satisfied that they would return convinced of the efficiency of the remedy we have recommended. As previously mentioned in this report, a very large majority of the Fifeshire farms are accommodated with servants' cottages, and those still wanting them are speedily being supplied. About four-fifths of the servants are married, and live comfortably and contentedly with their wives and families in these cottages. Every man has his nice little garden, or division of garden, and perhaps a pig, which he feeds for the winter's pot. His home is his whole possession, and his daily aim is to make it happy and comfortable. The humble, but tidy, little cottage is as dear to him as the noblest mansion in the kingdom is to its favoured

possessor. He is closely associated with the farm and everything around it, and to change his quarters, would be to entail a sacrifice of feeling and comfort which he rarely is able to overcome. Hence, many of the agricultural labourers of Fifeshire of the present day have been employed on the same farms for ten, fifteen, and even twenty years and are as warmly interested in the welfare of the farmer as he is himself. The servants' families when grown up are often employed under their father, or engaged on neighbouring farms; and are thus seldom beyond the healthy influences of the parental circle. Generally speaking, farm labourers are very liberally paid in the county; the increase during the past twenty-five years being equal at least to 100 per cent., or equal to an increased rental of about 7s. 6d. per acre. Ploughmen receive from L.24 to L.30 a-year, with about 16 gills of milk per day, and 2 pecks of meal per week, and sometimes 4 or 5 bolls of potatoes. In a good many cases the men servants are allowed about three-fourths of an acre as potato ground, the farmer furnishing the land, dung, and horse-labour. Women get from L.10 to L.15 a-year with rations. Harvest hands, when employed by the day, usually get about 2s. 6d. a-day with provisions, or in some cases with dinner only. "Bandsters" generally get from L.4 to L.4, 10s. per month, when not employed by the day. About 1850 wages were as near as might be one-half the rates given above, and at the beginning of the present century little more than one-fourth. In 1792 ploughmen got from L.6 to L.7 a-year, and women from L.2 to L.3; while day labourers were quite as poorly paid, many of them receiving only from 10d. to 1s. for their long hard day's work. Even in these days, however, the farm labourers of Fife are said to have lived comfortably, and to have fed and educated their children well.

Commercial Interests.

The commercial interests of the county of Fife are numerous and very valuable; and our report would be incomplete without a few remarks regarding them. The space at our disposal, however, would not admit of anything like a full notice of all the various interests, and therefore we shall content ourselves with a few statistics and facts respecting their recent progress, and present extent and value. We shall begin with

Minerals and Quarries.—The coal mines of the county are numerous and very valuable. They afford employment for a great many people, and yield a very large revenue. It has been computed that the quantity of available coal within the bounds of the county is equal to about 1,098,402,895 tons, which places it fourth in Scotland with regard to the stock of this valuable commodity, the counties exceeding Fifeshire being Edinburgh, Lanark,

and Ayr. The number of tons shipped coastwise from Kirkcaldy in 1858 was 35,773, and the number exported abroad 35,005, the declared value of the latter being L.15,754. In 1859, 39,026 tons were shipped coastwise from Kirkcaldy, and 60,695 tons exported abroad, the declared value of the latter being L.23,534. In 1869, 56,272 tons were shipped coastwise, and 203,466 tons exported abroad, the value being L.68,307. The number of tons shipped coastwise in 1870, was 60,081; and exported abroad, 204,890, the declared value being L.72,593. In 1873, the number of tons shipped coastwise was 76,180; and exported abroad 180,815, the declared value being L.147,946. Ironstone also abounds very extensively in the Dunfermline and Kirkcaldy districts, and is extensively worked. The quality is excellent, and the percentage very high. There are several very large iron works in the county, and at Inverkeithing and Kinghorn sailing vessels and steamers are built of home-made iron. The quarries are numerous and large. The freestone is of very fine quality, and is extensively exported, several magnificent buildings in Edinburgh and other Scotch towns being constructed of Fifeshire freestone. As already stated, a large quantity of lime is burned every year, part of it being used at home, and part exported to other counties. Whinstone is quarried for building purposes in considerable quantities, while there are a number of brick and tile works in the county, the clays of Fife being specially adapted for purposes of this kind. There are no obtainable data upon which to calculate the exact increase in the annual value of the coal mines in the county during the past twenty-five years, but the increase in the yearly exports from Kirkcaldy affords a very fair criterion. The total value (or rental) of minerals and quarries in 1864 was L.35,025, and since then a few collieries have increased by about 100 per cent., a great many from 20 to 50 per cent., and some about 10 per cent. Ironworks have advanced from 10 to 50 per cent., and quarries from 5 to 50 per cent. There are in all upwards of seventy coal pits in the county, and over 3500 men and boys are employed in the work. In the Dumfermline district the pits are very close to each other, and have been worked for such a length of time that a great deal of the land here is wholly undermined. The quality of the Fifeshire coal is good. Inkstands, picture frames, brooches, and various other articles of ornament, are carved out of the cannel coal found at Wemyss. The Mines Inspection Act divides Scotland into two districts—an eastern and a western—and Fifeshire is included in the former, which in the year 1866 numbered 254 collieries, the number of miners employed being 21,200, and the amount of coal raised 6,100,000 tons. The western district numbered 1218 collieries, employed 20,046 miners, and yielded 5,934,638 tons of coal. The miners of

Fifeshire are considered superior in respectability and intelligence to the greater number of their brethren in the west of Scotland. They are well paid and live very comfortably and quietly. The average wage of miners in Scotland (and Fifeshire may be taken at the same rate) in 1851, was reckoned at 2s. 6d. a-day; in 1854, 5s.; in 1858, 3s.; in 1863, 5s. 6d.; in 1864, 4s. 9d.; and in 1868, 4s. 6d. Some two or three years ago, miners in many cases were earning as much as 10s. a-day, but now the rates have lowered to little more than the standard in 1868.

Manufactures.—Fifeshire is one of the most important manufacturing counties in Scotland. Justice could be done to this extensive branch of industry only by devoting a special report to itself: and therefore our few remarks here must necessarily be very imperfect. The yearly valuation of the mills, manufactories, and other public works, in 1865, was L.18,124. Linen is the staple production, for the manufacture of which the county is justly famed all over the country. Mr Warden, author of a comprehensive treatise on "The Linen Trade, Ancient and Modern," calculated that in 1867 there were 51 flax, jute and hemp works in Fifeshire—74,658 spindles, 5038 power looms, and 11,579 persons employed in the trade. Linen has been produced in the county for upwards of 200 years, but it was after the advent of the present century that it began to develop properly. Of late it has increased immensely. In 1743 the number of yards of linen stamped in Kirkcaldy was 300,000, about 1780 it was 1,000,000, and in 1818 no less than 2,000,000. At present there are upwards of 1000 hand looms in operation in the county; the number of power looms is about 2700, and the quantity of cloth annually made by hand and power is considerably over 30,000,000 square yards. Mr Bremner, in his "Industries of Scotland," published in 1869, says, that "Dunfermline is the chief seat of the manufacture of table linen in Britain—indeed it may be said, in the world. . . . There is more linen cloth manufactured in Dunfermline than was made in all Scotland in any year preceeding 1822, and the value of the goods produced cannot be much under L.2,000,000 a-year." The county is specially noted for its manufacture of table cloth, and Fifeshire firms have frequently had the honour of supplying royal orders. Floor-cloth is manufactured very extensively at Kirkcaldy, where two very large floor-cloth works—the only factories of the kind in Scotland—are busily employed. In one of these works about 200 persons are employed. There is also a large fishing net manufactory in Kirkcaldy.

Fishing.—Fifeshire partakes pretty largely in the "harvest of the sea." Along the east coast especially, there are several fishing villages. Anstruther, however, may be called the headquarters of the fishing persuasion. In 1825 there were only 58

boats at Anstruther, but a few years ago a fine new harbour was constructed, at a cost of between L.60,000 and L.70,000, and now the fleet is a large one. In the Anstruther district, which includes all the fishing stations in the county, the number of boats in 1873 was 787 ; the number of fishermen and boys, 2911 ; the number of fish-curers, 42 ; the number of coopers, 86 ; the value of boats, L.27,675 ; the value of nets, L.53,445 ; and the value of lines, L.14,485. The total estimated value was thus L.95,605, or about L.20,000 below Buckie, the highest valued district in Scotland.

ON THE IMPROVEMENT OF WASTE LAND ON THE ESTATE OF BARBRECK, ARGYLLSHIRE.

By Rear-Admiral Campbell of Barbreck.

[*Premium—The Gold Medal.*]

The following report has reference to the drainage, &c., on the farms of Leregychonie and Barvullen.

This is a plain of about 130 acres in extent, from 28 to 38 feet above the level of the sea, having the advantage of all day sun even in winter. It was, eight years ago, waste land, so soft as to be dangerous, and even sometimes fatal to cattle and sheep.

At the lower extremity a rude dyke was thrown across, to form a mill-dam, which was fed by mountain streams ; and in very wet weather a great part of the land was submerged. On the water subsiding in spring, sheep from the neighbouring mountains died in great numbers from eating the herbage which had been under stagnant water.

The bases of the surrounding hills (for the plain is so surrounded) had afforded the only arable ground on the respective farms, and these were cropped to the edge of the morass, so that the best of the land, probably for ages, had been washed down to the plain below, where the sour and stagnant water of course prevented any healthy vegetation ; and a deep bed of the richest possible loam lay there worse than useless.

Throughout this plain, with the exception of about 20 acres (where the moss is deep), the subsoil is gravel, and is covered by from 3 to 5 feet of loam and moss.

It was found that the levels admitted of the mill-dam being placed close to the mill, instead of a quarter of a mile from it, and *below* the place chosen for the outfall of the drainage of this singularly valuable subject ; and the whole plain was open drained preparatory to thorough drainage.

After two years the ground became solid enough to admit of

this, and a leading drain 3 feet wide was taken up through the *bed* of the old dam (now dry rich land) for a mile and a quarter, gradually narrowing towards the head, but from 5 to 6 feet deep throughout, so that the sub-leaders have a clear *drop* into it. The small drains (4 feet) have a similar drop into the sub-leaders, and are carried up so as to terminate in the base of the hills, where the subsoil is very open gravel. By thus raising the heads of the drains a constant scour is secured, and that by the purest water. This open subsoil before the drainage was so full of water, which was kept on dam by the close loam below, that it used to rise to the surface as the only outlet, and sour the whole plain. The advantage of having the heads of the drains carried up as I have described has proved so great that fewer drains effect the same object, and not only is much outlay saved, but the pipes are kept as clean as gun-barrels. Of course, this advantage can only be attained in hilly districts, but in such districts it never should be overlooked. An additional advantage may be attained, as in the case I refer to, by placing field stones over the pipes to within 18 inches of the surface, for about 12 feet from the heads of the drains, the throw of water being much increased thereby.

The leading drain for so considerable an extent of ground must of necessity require a large duct (in this case its capacity at the outfall is nearly 3 feet by 15 inches), and it was found that pipes of the required size would be very expensive ; the plan was therefore fallen upon of joining open-ended boxes made of old larch, in the faucet joint form. These boxes are not only fastened with nails, but with wooden pins. The idea of using wood was taken from finding a plank under the foundation of an old bridge perfectly fresh, after being there upwards of 100 years.

The main outfall is upon a flat rock 2 acres in extent, *over* which the main stream runs, and the spread of the water being so great, the run from the great drain is *never* stilled even in the heaviest floods.

At the head, this drain is $2\frac{1}{2}$ feet below the level of the bed of the main stream, and by a few large pipes connecting the two, the whole of the water from the stream can in dry weather be turned in to scour out the leading drain.

This land had been let in very small farms, and most of the tenants had fallen into hopeless difficulty, which obliged the proprietor to take it into his own hands for improvement. The drainage was not quite finished when one of the largest sheep farmers in the country (without the lands being advertised) offered to take the greater part, at a slight increase of the old rent, and to pay $6\frac{1}{2}$ per cent. on the gross outlay, and he now holds them on these terms.

The fall in this plain from end to end is only 10 feet, so that in former days the water, after souring the ground, went off chiefly in evaporation. It is therefore not surprising that the air, which used even in summer to be cold and damp for a great distance round, is now warm and genial; the ground, which was as I have described it, being now perfectly dry.

The cost of a portion was L.6, 16s., and a portion L.6, 4s., so that the average was about L.6, 10s. per acre.

This outlay is large, but there were several causes of expense which do not commonly occur; for instance, a new course had to be cut for one of the mountain streams, and the main or centre stream widened from 7 to 14 feet. The large and deep leading drain, which takes all the drainage water on both sides of this stream, was of course expensive. There are two sub-leaders passing under the stream, one falling in about 1000 yards up the main drain, the other 100 yards from the outfall. The former is 2½ feet under the bed of the stream, and is composed of fire-clay glazed pipes, over which the gravel is merely filled in, the joints being perfectly tight; for where there is no shifting, gravel is as tight in a short time, if always submerged, as any puddling. The latter is one foot under the bed of the stream, and is carried across by 9-inch fire-clay glazed pipes, so that these are about level with the bed of the stream when placed. In laying them, the stream above the crossing was temporarily turned into the great drain, and the pipes were made perfectly water-tight by being enclosed in a casing of Portland cement concrete 5 inches thick. When this was hard, the stream was returned to its course, and now flows over the cement, which is harder than most kinds of stone. This sub-leader, before crossing the stream, passes through 30 yards of rock from 1 to 2 feet deep, the only rock met with during the progress of the work except on first breaking ground.

In the course of the work, some very heavy springs were found; one in particular, in the deep moss, throwing after heavy rains a body of water (enough to fill a 2-inch pipe) about a foot high above the surface, as if on force. When a drain was taken through this spring, it was found to have made a large and very deep hole under the 4-feet cut, and before it could be laid with pipes, a number of cart-loads of gravel and small stones were put in until a run for the water was got suiting the rest of the drain, which was laid with 3-inch pipes. Over these, for about 4 yards on each side of the spring, 6-inch pipes were put about half an inch apart, forming a drain within a drain. These pipes were then covered with field stones to within a foot of the surface, and turfed over to prevent earth getting down, and all heavy springs were dealt with in this way. This expedient has never been found to fail, either in the case of springs or old stone drains so

often met with in old arable ground. If something of the kind is not done, the soil closes round the pipes, and the water must come to the surface as before.

The value of the land before drainage could not be more on an average than 4s.; but it must be remembered that on a great part of it, at certain seasons, the stock were subject to disease and accident. The present value is at least 25s. per acre, the flow of grass last summer on part of it, which was before the most wet and sour, having been beyond anything I have ever seen in the way of unsown grass. If it were not for the few acres of moss being of comparatively little value, this average might be stated considerably higher.

I make these few remarks to account for the heavy expense, but feel convinced that money could not be more profitably laid out.

ON THE RECLAMATION OF WASTE LAND.

By Walter Kidd, Balleny, Currie.

[*Premium—The Gold Medal.*]

The following report has reference to improvements made on the farms of Ramslacks and Balleny, in the parish of Currie, and county of Edinburgh, and especially in regard to the *reclamation of* 60 *acres of waste land*, part of Ramslacks.

I obtained a lease of the farms for nineteen years from Martinmas 1862, from Ralph Erskine Scott, Esq., trustee for Carteret George Scott, Esq. of Malleny, the then proprietor, and, owing to the bankruptcy of the out-going tenant, I got possession in April preceding.

Ramslacks contains about 230 acres imperial. Elevation above sea-level about 800 feet. At the date of my entry it was an open muir, apparently in its natural state, without fences and unenclosed, except by the boundary walls on the north and south sides, and, with the exception of about 20 acres, covered with heather. Patches of the land had, at a remote period, been under cultivation, and 60 acres, now enclosed as two fields, had never been ploughed. The value of the land at this time will be afterwards given.

Balleny contains 160 acres imperial. Elevation above sea-level about 700 feet. This farm had been wrought as an arable farm, was enclosed in small fields of from 5 to 15 acres, and was in a wet, sour state for want of drainage.

Generally the improvements were—

1. *Trenching.*—A good deal of trenching was necessitated

in removing a great many of the fences, with a view to enlarge the fields on Balleny to from 20 to 30 acres each.

2. *Drainage.*—I drained the whole of both farms, excepting 40 acres having a light soil, about 18 feet apart, and from 3½ to 4 feet deep. These 40 acres were drained 30 feet apart, at the same depth. Average expense of drainage per acre, L.6, 10s. Total expenditure, exclusive of cartage, L.2502, 10s.

3. *Liming.*—200 acres of the farm of Ramslacks have been limed with 7 tons to the acre. Expense about L.5 per acre.

4. *Fencing.*—The land of Ramslacks is now properly enclosed, being divided into six fields, three of 50 acres each, one of 15, and the 60 acres of reclaimed land into two fields of 30 acres each—5 acres being under plantation. The fencing put up being fully 60 chains of dry stone dykes, 5 feet in height, built with the stones cleared out of the reclaimed ground. Expense of building, 16s. a chain, and 86 chains of wire fencing at 7d. a yard. Total expenditure for division fences on the farm of Ramslacks, L.104.

I may here add, that the proprietor completed the enclosure fences shortly after my entry.

Details of Operations on Sixty Acres Reclaimed.

Soil.—The greater part of the soil is heavy, with a tough clay subsoil; the remainder, about 10 acres, is light, with a freestone bottom.

State of Land previous to Improvement.—The land was tufted with short scroggy heather and bent, thickly interspersed with stones, a great many requiring to be blasted before removal, and full of holes and deep ruts, caused by the action of the weather, the holes generally standing full of water. It was then valueless, and would not have afforded sustenance to half a score of sheep, and if let by itself would not have brought L.3, being less than 1s. an acre. The draining and liming completely changed the seeming poorness or unproductiveness of the soil, and it is now capable of carrying fair crops.

Fences and Road Making.—In 1865 I commenced to blast and remove the stones for building fences and making roads. The dyke dividing the two fields, extending to 28 chains, was totally built of the stones gathered from the land. Expense, 16s. per chain. A road, 30 chains in length, leading from the steading to these fields, was also made with the stones taken from the reclaimed land. Expense of breaking stones, 11s. per chain. Total expenditure of these 30 chains, L.16, 10s. There were in all, as already stated, 60 chains of 5-feet dykes built on the farm of Ramslacks with the stones got from the land brought in; and in

addition to these dykes and road, the stones gathered from the land were also used for making roads on other parts of both farms. In 1866 the land was drained—the clay or heavy soil 18 feet apart, and the free or light soil 30 feet apart, both at the depth of from 3½ to 4 feet. First ploughed in 1866–67, just as I found time. In 1868 I planted 10 acres with potatoes, with about 4 cwt. of bones and 3 cwt. of guano to the acre. The expense of seed and manure was L.6, and the yield about 14 bolls an acre; sold at L.1 per boll. In 1868–69 the whole ground was ploughed up and sown with oats; yield, 4 qrs. to the acre on the 10 acres previously cropped with the potatoes, and a quarter per acre on the remainder; value, 23s. per quarter. The land was ploughed in the winter of 1869; limed in the following spring with 7 tons the imperial acre, and reploughed and prepared for and sowed with turnips; manured with 4 cwt. of bones and 3 cwt. of guano per acre; yield, about 15 tons per acre; crop used on farm. In 1871, ground again ploughed, and sowed with oats and grass for hay; crop about 6 quarters per acre; straw heavy; price of oats 25s. per quarter. Hay crop following season; about one ton and a-half the acre; sold at L.3 a ton. 1873, pastured. 1874, oats; manured with 1 cwt. of guano and 1 cwt. of nitrate of soda an acre. Crop good, but still unthrashed. I think, from the bulk of the crop, the yield will be 6 quarters an acre. Weight of small quantity thrashed, 41 lbs. per bushel; which was sold at 28s. 6d. per quarter. Straw heavy.

The statement following shows the total expenditure on both farms, exclusive of the expense of clearing the 60 acres of waste land, which was done by my own men at odd times; and, therefore, I cannot give the exact expenditure, but on a rough calculation I estimate it at not less than L.2 per acre :—

Statement of Expenditure.

1. Buildings,	L.1,186	18	8
2. Drainage,	2,502	10	0
3. Liming,	1,000	0	0
4. Fencing (exclusive of boundary fences erected by landlord),	104	0	0
5. Roads,	76	10	0
6. Estimated expense of clearing land,	120	0	0
	L4,989	18	8

Return for 1874.

Yield, 6½ qrs. per acre. Average price, 29s.
Straw about 30 cwt. the acre.

ON PLANTING IN EXPOSED AND MARITIME SITUATIONS.

By Lewis Bayne, Kinmel Park, Abergele, North Wales.

[*Premium—Five Sovereigns.*]

Those who engage in planting in extremely exposed or maritime situations need not look for immediate and certain success, nor be disheartened by the failure to some extent of their labours, as successful planting in such situations is always problematical, and requires great preparation and perseverance to ensure even moderately good results. It has been found from experience that certain trees will grow and thrive with various success in the most exposed situations when the soil is suitable; but when the soil is unsuitable, the success of the planting becomes doubtful, and ought not to be attempted without due consideration, and under any circumstance a reasonable time must elapse before the trees planted will have much appearance.

When the soil and subsoil is of a tenacious and stiff nature, there will be little use of planting any trees or shrubs without first thoroughly preparing the soil for their reception, as without this operation their chance of success will be very limited, even should the most suitable varieties of plants be selected.

After having the ground intended to be planted properly fenced and enclosed, the first thing to be done is to have it thoroughly loosened by trenching or ploughing. The former, although the most expensive method at the beginning, is by all means the best and most profitable in the end, and should be had recourse to where practicable, to a depth of from 20 to 24 inches, especially when the ground is of small extent, or when the planting is to be for ornamental purposes. When trenching is performed, it should always be kept in view to keep the surface soil on the top of the trenched ground, so that the young roots of the plants may have the advantage of the best soil to give them a good start. The under soil being well loosened by the trenching, is also improved by the action of the atmosphere, and particles from the good soil are washed down to it by the rain, while the surface is kept from becoming very wet by the rain-water getting away more freely. But when there is an over-abundance of moisture from rains or stagnant water, it is essential to have it removed by draining. In plantations we consider open drains the best, the depth, width, and distance between each other to be decided upon according to the nature and circumstances of each case.

In very exposed situations, where young trees are planted without the preparation of ploughing or trenching, and the necessary draining, on stiff soils, they become loosened by the action of the wind, and the swaying backwards and forwards

produces an open hole right round at the collar of the plant, which allows the air to penetrate the roots. In such circumstances the roots make little progress from the tenacity of the under soil. The holes fill with water, which in winter freezes to the roots of the plants when frost sets in, while the plants are often laid almost on their broad side, and make little or no growth for a year or two. On the contrary, they are likely to succumb to the influences of the weather from want of nourishment, which merely for the want of preparation of the soil the roots are unable to search for. Very different results may be expected when the ground is well trenched or ploughed and drained, as from the looseness and dryness of the soil on the surface and about the roots, the trees will have a chance of sending out their spongioles in search of food, and making good root growth, which enables them to stand the severity of the storm as well as to make upward growth. Without good roots it is, in the writer's opinion, impossible for trees to grow in the face of severe winds, these being their main stay and support, and good roots they cannot have unless the soil in which they are planted, when of a wet tenacious nature, is thoroughly loosened and drained. On the other hand, when the soil and subsoil is of a light or sandy nature and perfectly dry, neither trenching, ploughing, or draining will be necessary, because it is necessary to retain as much firmness in the ground as possible, so that the plants may be firmly planted.

When the planting operations have been finished, and the plants have attained a size of affording some protection to one another from the storm, a great measure of success will have been attained. But there is still an important part to perform, viz., the keeping and maintaining of the plantation, which will require great attention and judicious management until the trees have arrived at timber size. If the trees are neglected in any way, say from want of timely thinning, and allowed to be drawn up, their after chance of success and renovation by late thinning will be very small indeed; they will probably either be perished to such an extent as to become stunted, or on being thinned the wind may entirely overthrow them. When drawn up, they will have but small roots to struggle against the wind, and thus be the less able to withstand a storm. Having made these general remarks, derived from experience and observation, the writer will now refer specially to several plantations, of different ages, growing in very exposed situations, and containing various varieties of trees and shrubs, some of which are doing very well, others moderately so, and some to a certain extent failing to give the satisfactory results expected.

The first to be mentioned is a small plantation of about three acres, situated about four miles from the sea, and about 600 feet

above sea-level, the soil being of a cold clay loam, not well adapted for the early growth of young plants. The trees are a mixture of common and Turkey oak, ash, sycamore, beech, elm, and a few birch, with one or two laburnums, and service *berry* trees along the margin, all as near as the writer can judge from their appearance about forty-five years old. The subsoil rests on limestone rock, which in parts has been removed to some depth, forming in some places an undulation of 12 to 15 feet, where the trees are much larger than on the more level parts. This may be accounted for by the dryness of the soil, from much rubbish and mixtures of small stones being in the bottom, giving plenty of room for the roots of the trees to extend, and also from the fact of the prosperous trees not being growing so close to one another as those in the other parts. Another advantage they have is the shelter derived by their being placed in low ground, and having the other trees growing as it were above and around them. All the trees on the level are very small for their age, which is mainly due to the exposure of the situation, the coldness of the soil, and the want of thinning them in youth. The trees which have made most progress are the beech and sycamore, and the difference between them and their neighbours is very apparent. Along the margin there is a row of ash with a few Wych elm, and one or two Turkey oak, laburnum, and service trees, and as these have been receiving the severest exposure, one may judge from their appearance which are the best trees for planting when severe winds are to be contended with. The Turkey oaks contain more timber than their neighbours, having grown larger than either the ash or elm, but the branches and young shoots of the last have stood the severity of the winds better than those of the Turkey oak. The ash, on the other hand, are all blown with the wind to such an extent that their branches are grown towards the sheltered side, while those facing the storm have made little progress. The laburnum and service have both stood the exposure well. Near the outside are one or two larch which have made but small progress, not containing at present more than three cubic feet of timber, and having the tops entirely gone. All round this small plantation a young one was planted (about ten years ago), which is partly enclosed by a wire fence, and partly (on the west and most exposed side) with an upright paling fence 4½ feet high, having the pales or spars placed 1½ inches apart. This fence was erected for the double purpose of (1) protecting the trees from the inroad of stock and ground game (and avoiding the expense of wire netting), and (2) of sheltering the plants from the severe gales that blow on that portion of the plantation. At first sight the erection of this fence seems a good idea, and from the shelter afforded, success might very naturally have been expected.

Indeed this result, to a great extent, has been the case, but the success would have been much more marked had the fence been permanent. In the way of making alterations, however, this fence was removed in the autumn of 1873, and erected with the same view of protecting the trees in another young plantation, both from wind and animals. From the paling uprights being only 3 inches wide, and placed at 1½ inches apart, it might reasonably have been expected that a sufficient current of wind would have gone through between the pales to have hardened the trees to such an extent, as to enable them to withstand the exposure when the fence was removed, but the result was otherwise. Directly opposite where part of the fence was removed were growing birch and Scots fir, with a few oaks, and a good under cover of whins, and it was soon found that they had been too kindly nursed by the shelter of the paling to withstand the severity of the exposure. After its removal a great many of the Scots firs were blown down, and several of them half way over with their roots partly removed from the soil. The birch shared the same fate, and many of them had their roots drawn partially out of the ground—the same as if they had been pulled over. Had the fence been left, the result of the shelter might have proved otherwise, as they would have received the blow of the wind gradually as they grew up above its level.

This example goes to show the necessity of bringing up young trees in extremely exposed positions as hardy as possible, so that they may take their girth in proportion to their height, and make good root growth, so as to hold them firm in the ground against severe weather. The writer is of opinion that when shelter is to be provided by the fencing of young plantations in exposed situations, the best fence that can be made use of is a good stone wall or dyke with a rough and irregularly projecting coping. By the coping being thus irregular, with a few inches projection over the sides of the wall, the wind is broken as it rises on the wall, and is prevented from coming in contact with the tops of the trees in great force, or at once, whereas with a level coping of the width of the top of the wall without any projection over its sides the wind rises over the wall, and meets no obstruction, coming against the trees in much greater force above the level of the wall than if there had been no wall or shelter whatever. Many prefer artificial paling, brush, or *stake* and *rice* shelter to stone walls or dykes, and such fences are probably sufficient for the purpose in view, providing they are upheld until the trees can do without them. But this becomes expensive, without even providing the plantation with a permanent fence, which the stone wall or dyke is.

The following remarks apply to a plantation extending to

about ten acres, and planted with the following varieties of trees, namely, oak, wych elm, Scots fir, larch, and spruce. It is situated about two miles from the sea, and 40 feet above its level. The ground is on a slight slope or rise, and of various descriptions of soil, part of it being pure sand to a considerable depth, parts light, thin, poor loam and sandy subsoil, and parts poor loamy clay with a clay subsoil. The geological formation is limestone, but at a considerable depth. The plantation is protected on the one side by a wire fence, and the remainder partly wire fence, and old hedge and ditch, which had been the division between the fields before the ground was planted. The ground had, some years previous to being planted, been *under* or *furrow* drained with pipe tiles to a depth of 3½ feet, and at the distance of 30 feet between the drains, and on the ground being planted it was well turned over to as great a depth as possible with four-horse ploughs, and again drained with *open* drains 30 feet apart, and to a depth of about 15 inches.

On the east or sheltered side of the plantation is a strip of old oak trees; also younger wych elm, sycamore, and birch, but which have little or no effect in the shape of shelter towards the younger trees. The plantation is now twenty years old, and has been several times thinned, during which process the larch and spruce were principally removed on the west or exposed side of the plantation, giving preference to the hardwoods and Scots fir as standards, while on the east and sheltered portion the spruce fir have had the preference with the hardwoods, and the larch and Scots removed.

There is every appearance of health throughout the whole plantation, amongst the hardwoods, Scots fir, and spruce, with the exception of the extreme margin, where any few larch and spruce that have been left in the thinning are not thriving.

The larch show less signs of hardiness than the spruce, and although planted and growing on the margin of the ditch, which is about 3 feet deep with the soil thrown inwards to the plantation, therefore rendering the soil perfectly dry. There is not a single larch that has not lost its leader, and is not bent and twisted with the wind. In most cases they are dead several feet from the top downwards, and in the thinning many were found dead altogether, or in a dying state. The same stuntedness is also shown in the larch on the sides of the drive, where there is an opening for the wind to strike against them, while any that are growing towards the sheltered side are in a much more healthy state. This shows that the larch is not well adapted for planting in exposed or maritime situations. The spruce on the exposed margin, although keeping growing make but little progress. There have been few deaths among this class resulting from the exposure, although many of the trees

are one-sided, with their foliage on the exposed side quite red, while on the sheltered side of the same tree the foliage is nearly of its natural green. In the sheltered part or east side of the plantation, the spruce are making rapid progress, and appear to be in a very healthy state, having in many cases much overgrown both the larch and the Scots fir. The Scots fir, although not appearing to be the true variety, are all growing well, and within the last few years have made rapid progress. Those on the extreme margin of the west side are more one-sided, and have fewer branches than the others, but they show no signs of succumbing to the blast, giving evident proof of the endurance of the Scots fir over the larch.

The oaks are all growing moderately well where the soil is suitable for them, and those near the exposed margin have, in many cases, made considerable progress, although they are more stunted in appearance than their better-sheltered neighbours.

The wych elms are more numerous on the margin than the oaks, and have apparently been considered very hardy, and therefore planted on the exposed side, as shelter for the others. They have all a healthy appearance, and stand the winds better than any of the others. They have never been in any way pruned, and have therefore branches to near the ground. Indeed, it would not be advisable to prune them, but to leave as many branches on them as it is possible to obtain, seeing that the principal advantage to be derived from them is shelter for the rest of the plantation. The larger the quantity of small branches the better, so long as they don't appear to yield to the breezes.

Adjoining this plantation, along the margin of a garden, without any artificial shelter, a few Austrian pines and English yews are planted at distances apart of about nine feet, and in a row. The Austrian pines are about twelve years old, and were transplanted to their present situation from an open exposure in the year 1871, and the yews were removed in 1869. Neither the pines nor the yews have made great growth in their new position, but both appear to be in a very healthy state. The pines are growing steadily though slowly, with the branches on the exposed side stretching out against the wind, as well as on the sheltered side, and never showing any signs of the gale cutting their foliage. A few damson plum-trees in the same garden are gowing well in the face of the wind, but although showing plenty of bloom they seldom produce much fruit.

The next plantation to be noticed contains about four acres, and is situated about a mile from the sea, and is close upon its level on level ground, with an open exposure all round. The surrounding ground, and that betwixt and the sea, is a level strong clay soil or loam, or what may be termed in Scotland "carse soil." In the neighbourhood it is known by the name

of "marsh land," probably from its having been in a wet and marshy state before being drained and cultivated. Even now in many places it is very wet during the winter months, or in rainy weather, and from being level the water takes long to clear off. The plantation is also of a heavy clay soil, and subsoil of same stiff nature, and from the stiffness and tenacity of the soil, and exposure of the situation, planting has never been performed to any extent, even with the view of shelter.

The plantation referred to is partly fenced by a hedge and partly by an open ditch, and the remainder by a water-cut, into which the tide has access. The trees consist of oak, ash, elm, sycamore, beech, poplar, willow, alder, and Scots fir. A good many larch had been planted, but are now almost all cut out, and the few that have been left are quite dead. This result, in the writer's opinion, is owing principally to the unsuitableness of the soil, as the dead trees are standing in the interior of the plantation, and have therefore had the shelter of the other trees. From the appearance of the trees, and counting the concentric circles as the years' growth, the trees were ascertained to be from thirty to forty years planted, and none of them are of very large size, considering that age to be correct (which we believe it is), and the strong quality of the soil in which they are growing. This may be accounted for by the smallness of the plantation, the exposed situation on which they are growing, and the want of timely and proper thinning.

The north side, facing the sea, is margined with Huntingdon willow, and a few common alders and poplars, none of which have made much progress, the poplars being very much cut by the wind, the willows having much the same appearance, while the alders are not only of a sickly appearance, but have made a very small growth, and are comparatively smaller than any trees in the plantation. The poplars on this side are larger, and have made more wood than any of the other trees. The west side, which is much exposed, is principally composed of wych elm, with a few ash, sycamore, and beech, and one or two oaks. The oaks and beech are rather small, and also the wych elm, but the latter appear very healthy, and their foliage and young wood appear to stand the exposure better than the former varieties. The sycamores, although small, appear to be in a healthy state. The south, or sheltered side, consists principally of poplar, ash, and elm. The former are of good size compared with any of the other trees, and are much larger than the poplars on the other side of the plantation, which is easily accounted for by their having the shelter of the other trees, and an extra depth of dry soil, being planted close to the open ditch where the soil had been thrown out.

Taking the plantation as a whole, the oaks are few in number,

and none so good as the elm and ash, where the latter have had room. The wych elm rather small towards the outside, but some of them as large as the best ash towards the interior. The sycamores are generally small but of a healthy appearance; beech about the same size as the sycamore, and retain their leaves longer in a green state, the latter in a few cases decaying towards the extreme points of their leaders in the north or sea side. The average height of the trees throughout the plantation range from 30 to 35 feet, with girths at 6 feet from the ground varying from 3 to 8 inches (quarter girth), except the poplars, which are a few feet higher and about 3 inches girth on the exposed sides, and from 13 to 14 inches (qr. girth) on the sheltered side.

The general appearance of the foliage of the trees on the outward exposed sides shows the effects of the cutting winds by the brownness of the leaves. From the want of underwood as shelter in this plantation, it is proposed to have it cut down and planted with underwood and forest trees, with the view of raising a young plantation from the assistance of the shoots from the stools after the trees are cut down. This course is commendable from the existing trees being rather drawn up from the want of thinning, and as in their exposed position thinning now would be apt to check rather than increase their growth without providing the necessary shelter.

With the view of showing the effects of severe prevailing winds on various varieties of trees, it may not be out of place to refer to several growing singly in hedgerows and in the margins of plantations, and other places, which the writer has an opportunity of observing daily in the course of following his occupation.

Oak, Common, although planted in favourable soils, and in moderately exposed situations, is far from being suited for situations exposed to prevailing winds. Many are to be seen both on the outside of plantations and in hedgerows, although attaining moderate size, much cut by the winds, and all one-sided, and leaning and growing towards the east, or as it were growing away from the blast, having a very stunted appearance, and in many cases covered with *galls,* and the leaves having a dry and curled unhealthy appearance.

The *Turkey Oak* grows more quickly, and does not seem to suffer from the wind to nearly the extent of the common oak, and where they are growing side by side, the Turkey oak is growing healthy and vigorous in exposed places, where the common variety has a very scrubby and unhealthy appearance.

Scarlet Oak does not stand the wind in this quarter, and in moderately exposed situations is far from doing well.

Ash.—This tree, when growing in hedgerows, where the soil has been well prepared, attains moderate size, but on the margins of plantations it makes less progress, and from its not being a

first-class shelter tree, nor profitable unless clean grown, the writer does not consider it a good hedgerow or margin plant in exposed positions. If, however, it is growing in exposed situations, intermixed with other trees, it makes considerable growth, and in suitable soils will be found more profitable than many other hardwood varieties.

Elm, Scotch or *Wych,* and *English.*—The former stands well in exposed hedgerows and plantations, and although not growing to extra large size, is a good shelter plant, from its having numerous branches and twigs, which yield to the breeze, without being much injured, and as it is in most cases much more upright and less blown or one-sided than the ash, the writer considers it a better margin plant for exposed plantations than any of the above-named trees. The English elm is less hardy, but in a good dry loam attains a large size even in exposed situations, and in some instances doing equally well alongside of the wych elm, growing to a large size, good shape, and with healthy foliage.

Sycamore grows well, in some instances attaining good size and age in extremely exposed situations, while in others it is not doing well while young, nor attaining average size at advanced age. A small plantation, which is about ten years old, in an exposed place, has had the sycamore cut down, and died off to near the ground by the severe winds. On the other hand, some hedgerow and margin of plantation trees are doing moderately well and maintaining a good shape and healthy appearance, and where the ground is at all suitable, it is much to be recommended for planting in exposed situations, both for ornament and shelter, as well as for profitable purposes. From the round shape and the closeness of its branches and foliage, it is a first class shelter tree when it arrives at an average age and size.

Beech, where the soil is dry and light, is growing well in exposed places, and from the length of time it retains its foliage in their weathered state, makes it a good tree for shelter, but where the soil is heavy and stiff it makes slow progress, and dies at an early age.

Chestnut, Spanish.—Few are to be seen growing in exposed situations, and where there are any much exposed to the winds they are in a very unhealthy state, and have made but small progress. They are generally dead, or dying towards the top, and the stem of the tree more or less covered with spray. It is therefore not at all adapted for exposed planting.

Chestnut, Horse.—This, like the last-noticed variety, is not well adapted for severe exposures, as both buds and branches are very liable to destruction by even moderate winds.

Lime, seldom seen in exposed positions, and the few the writer has seen, show inadaptation to a very windy site. The young shoots die away year after year.

Poplar, Black Italian, is not growing well, nor making much wood in exposed places, and none of them have anything like a healthy appearance; in most cases their branches dying and young spray taking their place.

Common Black Poplar, growing to a larger size, and having a much better shape and healthier appearance than the last-named variety, and even where growing in hedgerows, and very much exposed, has attained considerable size, but when large it has a tendency to have its branches broken or destroyed by the wind.

The *Lombardy Poplar* appears to be very hardy, and grows to a good size, but from its upright growth does not give great shelter unless planted very close, but when so planted it answers the purpose well in its young state.

Huntingdon Willows are, as a rule, one-sided, and don't grow to a large size, but in the most exposed situations and near the sea they are the means of producing good shelter.

The *Birch* is generally growing well in moderate windy positions, and although leaning to one side has in many cases a pretty good top, and from its adapting itself to poor soils will thrive in high and exposed situations, where few other deciduous trees would grow to any size.

Common Alder, wherever it is to be seen here in very exposed situations, is a mere scrab, and in most cases covered with seed, and therefore not well adapted for planting in the face of severe winds.

Wild Cherry or *Gean* trees are not numerous in exposed places, but stand the storm very well while in their young state, and have a healthy and ornamental appearance, but they are apt to be damaged when old by the wind breaking their branches.

The *Mountain Ash* grows well, having a good shape and all the appearance of good health, and is much to be recommended as an ornamental and shelter plant in exposed sites.

The *Service Tree* is a little one-sided, but not in any way disfigured by the wind, and may be considered very hardy.

Laburnum appears to stand the wind moderately well, but in few cases attains much size, and is liable to have its limbs broken off at the joints.

Common Thorns grow well in hedges, and as single specimens are a little one-sided, but have, however, good tops, and produce good shelter.

Sloe or *Black Thorn* grows in abundance in the hedges in exposed situations near to the sea, and seems to thrive well.

Evergreen Oak succeeding well wherever planted, and has the appearance of being very hardy. It grows to a large size and of good shape, with healthy foliage in very exposed positions. In few cases is it blown or one-sided, and therefore a first-class tree for planting, either as ornament or shelter, in exposed situations.

Holly.—The common holly is very numerous in the hedges, both kept low as a fence, and left to grow at its own accord. It has the appearance of making a good hedge plant in exposed places, as it grows very close, and where growing as a tree or shrub, although much blown to one side and cut by the wind, attains considerable size, and makes progress in very exposed places. The writer has cut down trees of eighteen inches diameter, which were blown and grown so much to one side that they had the appearance of being switched with a hedging knife, so straight and close was the surface of the branches and foliage, and still having a very green and healthy appearance.

Hazel is growing to moderate size in extremely exposed situations, but where growing alongside of the common thorn, is much more wind-blown and one-sided, and also less hardy than the thorn.

Elder is growing well in very exposed situations, and from its fastness of growth is a good nurse plant in suitable ground in exposed situations.

Portugal Laurel when growing in the face of the wind does not make great progress, and is very much one-sided and cut by the wind on the exposed side.

The *Common Laurel* is rather thin of foliage. It takes, however, a good upward growth, although not very bushy.

The *Arbutus* is growing in moderately exposed positions in a very healthy state, having beautiful foliage, and well covered with flowers and fruit.

The *Common Dog Rose* is also growing freely in a wild and rambling state in exposed hedges.

Scots Fir in many cases appear very one-sided from twelve to twenty years planted, and very bare of branches on the exposed side, having an almost flat appearance; while much older trees with a clean stem have their tops one-sided. But in most cases the old trees have a healthy appearance, and not much cut by the wind.

Austrian Pine everywhere shows a very healthy and robust appearance, with their branches growing well out against the wind, and even where the stem and whole tree is blown towards the east by the prevailing winds, the branches and foliage retain their position and colour. This variety, although not making much more upward growth than the Scots fir, grows more stiff, with abundance of branches and foliage, and is therefore much to be recommended as a margin plant in exposed plantations.

The *Pineaster* is not numerous here, but in the few instances to be met with they have not the healthy nor hardy appearance of the Austrian pine, and are in most cases blown to one side.

Larch does not appear to be at all hardy in very exposed situations, and shows signs of decay at a very early age. Many

trees under twenty years of age have died back several feet from the top, the writer having cut down many of them, with several leaders striving for life in the face of the wind; while others within the plantation were perfectly healthy, although the tops were a little bent by the wind. The writer does not find the larch to be much more hardy than the common spruce, and in some cases not equal to it.

Common or *Norway Spruce* are generally one-sided and browned in the foliage in the exterior or margin of exposed plantations, and not in any way adapted for extremely exposed situations.

Silver Fir.—The writer cut down several trees of large size a few years ago, which were growing in a very exposed situation amongst hardwood trees. They had overgrown all the trees near them, even one or two Scots firs were not half their size. and on several very exposed places has he seen the silver much larger than the Scots fir, although not being of good symmetry, nor of a very ornamental appearance.

English Yew.—Many of good size, and generally blown and one-sided when exposed to prevailing winds. They appear to be of average hardiness.

Cedar of Lebanon, although growing to considerable size, is generally a little one-sided, with its top growing as it were away from the blast.

Cedrus Deodara does not succeed well where in any way exposed, is very much one-sided, and far from having a strong healthy appearance. Does not stand nearly so well as the last-named variety.

Wellingtonia gigantea is growing well in moderate exposures, but the writer has not had an opportunity of noticing its adaptability to stand extreme exposures.

Weymouth Pines do not succeed in exposed situations, and in moderately windy positions are much one-sided.

Cupressus macrocarpa grows well out against the wind, and has a beautiful and healthy appearance, very hardy; well worth planting in moderate exposures.

Cupressus Lawsoniana grows moderately well in exposed situations, and keeps its shape fairly well.

Thujopsis borealis makes more luxuriant growth in the same exposure than the *Cupressus Lawsoniana,* and from the strength of its foliage appears to be more hardy, and better suited for exposed planting.

Many other varieties of plants might be noticed, such as *privet, Berberis* of variety, *dogwood, snowberry,* and other evergreen and deciduous shrubs, but the writer considers it unnecessary to refer in this paper to the smaller varieties of shrubs. During the last few years the writer has planted rather exten-

sively in exposed situations, both in quantity and variety of plants, including the common kinds of forest trees and shrubs, viz.:—Common, Turkey, and scarlet oak, ash, Scotch and English elm, sycamore, maple of variety, beech, birch, poplar, willow, silver alder, elder, common and variety, sea buckthorn, common and black thorn, evergreen oaks, hollies, arbutus, yews, guilder rose, mock orange, lilac, spiræs of sorts, privet of sorts, Mahonia, Berberis, Weigellias, sweet briar, Lonicera in variety, snowberry, dogwood, *Leycesteria formosa*, &c., Scots fir, Austrian pine, Pineaster, Corsican pine, American spruce, &c. All are too young, however, to be noticed specifically in illustration of the subject of this paper, but a few general remarks may be made regarding them. As a general rule, the sycamore, maple, and wych elm have been found to be the most hardy and most suitable deciduous trees for planting in exposed situations, and the Austrian pine the best coniferous, or fir tree, for that purpose. The evergreen oak, arbutus, and holly, the best evergreen shrubs of large size, and the sea buckthorn, wild cherry, elder, and mountain ash, of small sized trees, and shrubs of the deciduous kinds; and of small shrubs, tamarix and snowberry, although many of the others may prove better in different soils than those named. The writer has found the silver alder (*Alnus incana*) very hardy in its young state, but he has no experience of its growing to a moderate size or age. The Corsican pine grows well in very exposed situations in its young state, but from its being a bad rooter, it may become unsuitable as it grows up. It is, however, when young a fast grower, and stands the exposure well. The *Pinus maritima*, although highly recommended as a sea-side plant, has not succeeded in the writer's experience where the ground is stiff or in any way inclined to be damp.

In forming plantations in exposed situations it will be found advantageous, if not almost necessary to ensure success, to make the plantation of as large an area as the circumstances of the case will admit of, as trees will in many cases grow, and even thrive, when planted in large masses, which would actually starve in small clumps or belts. Another important matter to be attended to is the thorough preparation of the soil, by trenching or ploughing, draining, &c., and great care should be taken in selecting the most hardy and suitable varieties of trees, and those that are likely to succeed in the soil into which they are to be planted. The plants used should be small, and well transplanted; and those that are known to stand severe winds and gales, without taking into consideration their being of little value as timber trees, should form the margin of the plantation, while the more valuable varieties may be used towards the interior, even if less hardy, providing that the soil is suitable. In this

way the less valuable class provides shelter for their more profitable neighbours.

In every case it will be found to be judicious to plant thickly, with the view of shelter, and to thin early, for the purpose of maintaining and bringing up the trees in a healthy and hardy state, and so that they may not be drawn up, but take girth along with their height.

ON THE SOILS AND SUBSOILS SUITED FOR PLANTING.

By William Gilchrist, Cluny Castle, Aberdeen.

[*Premium—Five Sovereigns.*]

As a general rule, soils and subsoils that are considered suitable for growing the various species of forest trees are those that are unsuitable for agricultural purposes, consequently trees are often planted in soils and subsoils quite uncongenial for their growth and development. Although there is no doubt that soil and subsoil exercise a considerable influence on the development of trees it is not altogether paramount, as, however suitable they may be, if the exposure is too severe, or the altitude too high, the trees will not succeed. Altitude and exposure must, therefore, be taken in connection with soil and subsoil, as suited for the growth of timber trees. Altitudes are generally described as low, medium, and high—low being under 350 feet, medium from 350 to 800 feet, and high from 800 feet upward.

In describing the different soils and subsoils we lay no claim to a scientific knowledge of the subject, but simply base our report on practical experience and observation. Relying on this basis, the chief difficulty is to get examples alike in every respect, as almost every situation has some local peculiarity that, in some way or other, tends to stimulate the growth of trees. In some parts of the country the soils are so variable that it is often difficult, without a chemical analysis, to distinguish between peat and loam, the one running so much into the other; and there is no doubt that many of the inaccurate statements, regarding the suitableness of certain soils and subsoils for the development of forest trees, may be traced to this cause.

1. Peat.—This is generally understood to be the natural accumulation of vegetable matter on the surface of waste lands, and is always more or less saturated with water. Considered as suitable for the growth of wood, it must be divided into two distinct classes—first, the natural accumulation of wooded vegetable matter; and second, the natural accumulation of succulent vegetable matter. The former of these is generally suitable for grow-

ing wood, while the latter is only occasionally, and under special circumstances, fitted for that purpose.

1*st*, Brown peat, with an open subsoil on the granitic formation. This is the prevalent soil on hill sides and moorland that is covered with heath. It is well suited for the growth of Scots fir at low and medium altitudes. In many cases the Scots fir produces good timber on this sort of soil at altitudes ranging above 1000 feet; but these are exceptional cases, and are generally found to be in sheltered and otherwise favourable situations. The quality of the timber on this sort of soil depends entirely on the depth of the soil and the openness of the subsoil. If the peat soil is deep the young trees succeed very slowly for a number of years, until their rootlets get through into the substratum, after which they grow more rapidly; but at the best the wood is soft and rough in the grain. When the trees are cut down the concentric rings for the first fifteen or twenty years are found to be comparatively small, after that period they gradually increase. When the soil is shallower the trees grow more equally throughout, provided always that the subsoil is open, and are smaller in the grain, and the timber of superior quality. When in a young state they generally grow with a good deal of taper; but with a medium altitude and a suitable situation they will, at the age of sixty, have from 30 to 35 feet of bool, and average about 10 cubic feet. Some of them will be considerably larger, but in all plantations of that age there is a certain amount of spar-wood, and sometimes even props, which take down the average size.

This variety of peat is also very suitable for birch and plane, especially the former, which in many parts of Scotland grows naturally on soil of this description. Still, although the birch is a graceful tree, and a rapid grower at low and medium altitudes, and on soil and subsoil most suitable for its growth, it is not to be compared, as a profitable tree, with the Scots fir, and should never be planted for profit except at high altitudes and hill sides, where, owing to the severe exposure, Scots fir does not succeed. We have never met with any large quantity of plane trees growing on this sort of soil, but, judging from what we have seen of it in mixed plantation, as also in groups and single trees, there is no doubt that the soil is suitable for its growth, especially over whinstone formation at medium altitudes.

At low altitudes this soil is also suitable for the growth of spruce in masses, and where a good demand exists for spruce it is a remunerative crop. When grown singly or wide apart they are, in general, very rough and branchy; but when grown in masses they are the reverse, and are very suitable for many country purposes. Willows and alders may also be grown, but the former almost invariably gets stagheaded when about forty

years old, and the latter is not a profitable tree at the best. It may, however, be grown as copse wood with advantage.

On low altitudes this sort of peat generally requires to be regularly drained from 2 to 2½ feet deep; but on medium and high altitudes it seldom requires to be close drained, except where the formation is flat.

2d, Peat containing a proportion of sand, and resting on a clayey bottom. This, at low and medium altitudes, will grow oak, lime, and elm to fair sizes, but not so profitably as it would Scots fir, spruce, and larch. The latter often succeeds very well and grows to good sizes on light soil, provided it has a cool subsoil such as referred to. What a number of contract planters call "fern ground" comes very near to this description, and it is invariably selected by them as a soil suitable for the growth of larch. No doubt, it is also quite suitable for the growth of the other trees mentioned, but larch is the most profitable and remunerative crop when the situation is suitable. The timber, when matured, is generally clean grown, with very little taper; tough, but only a small proportion of heart-wood, as compared with larch grown on heavier soils. Elm grown on this soil is soft and open in the texture, and more brittle than when grown on stronger soil. The same remarks apply to the ash; and a strange coincidence is, that both shed their foliage from ten to fourteen days earlier, when grown on peat soil, than they do on loam,—especially is this the case if the bottom is damp. On peat soil the timber of the oak—even the heart-wood—is brittle, soft, and open, with a comparative small proportion of heart-wood. The bark is also more corky, and does not contain the same percentage of tanning properties. However, the soil is quite suitable for its growth; and where it is desirable to grow oak as an ornamental tree, or for variety, a peat soil with a proportion of sand need not be considered any drawback; but it cannot be grown profitably on such soil.

The lime tree and willows (Huntingdon and Bedford) also grow to fair sizes on this soil, but in general they are very branchy, except when they have been artificially pruned. The former is the most suitable tree for the soil, although the willows at from forty to fifty years old are the most profitable, especially when grown at low altitudes. One of the chief drawbacks to growing willows on this sort of soil is their tendency to be blown over. Thorough drainage, so as to allow the roots to get down into the subsoil, is the only remedy. Of course, the tops can be lightened, but that is taking away the vital energies of the trees, and besides, the remedy is only temporary. The poplars do not succeed so well as the willows, and are liable to all their drawbacks, although they are often planted, and sometimes even grow to fair sizes. At low and medium altitudes

the Norway spruce can be grown profitably on this kind of peat, especially on the former and in sheltered places. In such situations spruce is one of the most profitable crops that this soil will produce. The *Abies Douglasii*, also grows in similar situations, at least to a certain age, but of course it is of too recent introduction to form a positive opinion as to the soils on which it will succeed; but in a young state, it promises well.

If the altitude is high and the situation exposed, this sort of soil and subsoil is best suited for growing Scots fir, and they will be found to be as safe and as profitable a crop as the soil can produce. The quality and durability of the Scots fir is much improved by a proportion of sand amongst the peat, especially if the subsoil be granitic. If on a limestone formation, the Scots fir is of a branchy habit, and the timber rougher than when on granite. They grow rapidly up to a certain stage, when they generally branch off into numerous leaders and get flat-headed. The stage at which this appearance occurs depends on the depth of the subsoil, as it is generally allowed to be caused by the roots coming into contact with some substance antagonistic to their development. Under the same circumstances, larch, besides losing their leaders, are affected with blisters and ulcers, and when such is their state, it is considerably reduced in value, and as a profitable crop is a failure. The hardwood stated as suitable for growing on a granite formation is more suitable for growing on a limestone formation under similar circumstances; thus showing that on the granite formations the fir tribes are the most suitable, while on the limestone formation the planter can have a wider choice.

3d, Peat of various depths, but generally shallow, with a moorband pan and hard subsoil, is very common in some parts of Scotland, especially on flat moorland. The soil is invariably wet on the surface, and in its natural state is quite unsuitable for the growth of trees. If thoroughly drained and the pan broken, Scots fir and spruce will grow on it to be a fair average crop. Unless thoroughly drained, the trees either die off young or get twisted into all conceivable shapes, and never attain to anything like timber proportions. The spruce is only suited for growing on low and medium altitudes, but the Scots fir will grow on either. Birch will do the same; but as mentioned before, it is not so profitable, and should only be grown where variety is wanted.

4th, Deep black peat, such as is generally used for fuel, is not suitable for the growth of trees under any circumstances; still, if it can be got thoroughly drained and a portion of the subsoil spread over the surface, a fair crop of spruce may be got to cover the ground; but unless the roots can get through the peat and into the subsoil, this sort of peat will not grow a pro-

fitable crop of trees. Some good crops of spruce and Scots fir are grown at low and medium altitudes on peat where the great proportion has been cast off for fuel, and only about one foot in depth left for surface; and where this is practicable, it is the safest way to secure a crop. Under such circumstances, neither the spruce nor the Scots fir grow to a large size, and at from fifty to sixty years old they may be considered at their best as a crop.

5th, Peat on a soft tilly or "boiling" clay bottom is unsuitable for the growth of trees, especially if the "boil" is near the surface. If there is as much surface soil as keep down the soft clay, any of the surface-rooting varieties may be grown, but they never grow to great dimensions, and are liable to be blown over at all stages. If the "boiling" clay can be got under by drainage the case is different, and wood may be grown profitably; but it is of the utmost importance that the drains should be kept at all times clear and in good working order. Spruce and alder are the varieties that will succeed best. The former is the most profitable, except in districts where a demand exists for alder.

6th, Bog peat, or the natural accumulation of succulent vegetable matter with a soft bottom. This, in its natural state, is the most unsuitable of all for the growth of trees. Still, if it is desirable to grow trees or shrubs, it can be made suitable by thorough drainage, digging over and exposing the peat to atmospheric influence, and adding sand. Treated thus it will grow good spruce, alder, and lime. Taking everything into account, it cannot be said that the undertaking would be profitable; but circumstances might arise where it would be very desirable to have such ground occupied, or partly occupied, by a crop of trees or shrubs and treated in the manner indicated; this has been accomplished at low altitudes.

2. Loam is a soil consisting of clay, sand, and oxide of iron, with more or less of chalk. The qualities are various, from a light sandy loam to a heavy clay loam. If the subsoil and situation are suitable for growing trees, all the different qualities of loam are found to be adopted for the growth of some of the ordinary varieties of forest trees.

1st, Light loam on a sandy or gravelly bottom. This is a likely soil for the growth of trees, and yet there is perhaps no soil so unsuited for the profitable growth of the trees that are generally found growing upon it, especially larch; and it is a matter of surprise that, with so many examples of failure, larch is still persistently planted on such soils. Even when they grow to fair sizes and present a fair exterior, we have found upwards of three-fourths of them to be unsound at the root, and consequently a great portion of the root comparatively useless. This heart-rot is found to begin at an early period; and if larch is to be grown profitably on this sort of subsoil, they must be

cut at an early stage for props and spars. During the summer of 1868, on such a soil and subsoil, in a mixed plantation eight years old, most of the larch and poplars died out; while the Scots fir, Laricio, Austrian pine, and plane stood apparently unscathed. The birch and beech were seriously checked, and have not yet recovered from the effects, but have still a languid and sickly hue. The larch were taken out and the blanks made up with Austrian pine, and they have stood the test of 1874. The plantation referred to is at a medium altitude. Scotch fir grown on this subsoil wants the dark green foliage that it has on heavier soils, and does not grow so tall, but the timber is generally pretty clean and of fair quality. The Austrian pine and Laricio do not change so much in the colour of foliage, and grow more freely; but we have not seen any of their timber cut up into scantling. Larch generally grows pretty freely up to thirty or forty years old, when it invariably begins to have a sickly appearance, becomes shorter in the foliage, and sheds its foliage from ten days to a fortnight before trees grown on heavier soils. Beech are generally short in the trunk, with scraggy, spreading tops, and of little value as timber trees. Birch and plane do not lose much of their ordinary habits, only they are of a great deal smaller dimensions than when grown on favourable soils. If the subsoil is damp, although of sand, it is more suitable for the growth of trees. Instances of this are invariably met with in plantations with an undulating surface, where, on the dry subsoil of the heights, the trees of all varieties are a great deal smaller than those in the hollows and low portions of the ground,—the only perceptible differences as to soil and subsoil being that the latter is more moist in the hollows. Of course, shelter must not be lost sight of; but all the difference cannot be attributed to it. This damp subsoil must not be considered as opposed to drainage for plantations, or apologising for stagnant water, as no soil that is surcharged with water is suitable for the growth of trees. On the other hand, where the water percolates freely through the soil and subsoil, it is not as a rule injurious to the growth of trees, but rather favourable. Under such circumstances, larch is the most profitable tree that can be grown, provided the altitude and situation are such that it will not be liable to be damaged by spring frosts. In inland districts the larch suffers most from frosts on southern exposures, and at altitudes ranging from 300 to 450 feet. In such situations, the crop should consist of two-thirds larch and one-third of Scotch fir, plane, oak, or beech, for all of which the soil and subsoil referred to is suitable, at altitudes not exceeding 1000 feet; above that altitude, the Scotch fir alone is most suitable.

2d, Light loam, with a hard clay or gravelly and clay subsoil, on a granitic formation, and at low and medium altitudes,

is well suited for growing silver-fir, lime, plane, and beech. Scotch fir and larch are also often grown—in fact, commonly grown; but on this soil the Scotch fir does not produce the same quantity of timber as the silver fir; and the larch only succeeds for about fifty years, when it is very frequently affected with heart-rot. On such a subsoil as this, very fine silver firs, plane, and beech have been grown at medium altitudes. Compared with the spruce, Scotch fir, larch, oak, and elm growing in the same plantation, the silver firs were much healthier, and contained at least one-third more timber than the other varieties; while the plane had grown as rapidly as the beech. The same sort of soil and subsoil, over limestone or whinstone formation, is best suited for the growth of oak, plane, elm, ash, larch, and silver fir, provided the ground is naturally dry, or has been previously drained. Under such circumstances the oak continues to grow rapidly, until the hard subsoil becomes too hard for the roots to penetrate, when its top loses the leading shoots, and becomes more bushy, and its growth as to height is generally at an end. The wood is, however, tough at all periods of its growth; but in general it is from sixty to seventy years old before much heart-wood is formed. On heavy loams, over limestone, we have seen large oaks with only one inch of sap-wood; while on light loams we have often seen the very reverse. Plane trees are more surface rooters; consequently they are not so much affected with the quality of the subsoil, provided the soil is deep enough; but on a light, shallow loam, they are invariably of small dimensions, unless they are supported and derive nourishment from the subsoil. Elm and ash grow freely, especially in glens or hollows; but neither of them attain the same size as they do on heavier soils. The ash is, however, generally of good quality. Larch is not so much affected with heart-rot on the limestone as it is on the granite; but it grows with more taper, and is shorter, and is very frequently affected with blisters. The silver fir grows freely on both, and the difference is not so perceptible.

3*d*, Medium loam, of good depth and open subsoil. This variety of soil is well adapted for oak, elms, and planes, as also most of the newer coniferæ, at low and medium altitudes. On this soil the plane grows to great size, and being generally sound, commands a high price. In fact, for some years back, good plane trees of large size have been about the best selling of our home wood. On deep loams they are proportionately larger in size; but we have not been able to detect much difference in the quality of the timber. Elms also prefer a deep loam; in fact, the deeper the soil the larger is the elm, both Scotch and English; but both require a considerable amount of shelter to produce good timber. In exposed situations both varieties are frequently affected with ring-shake, which is sometimes aggra-

vated by heart-rot. When such is the case, the value of the timber is considerably deteriorated. This sort of soil is also well suited for growing larch, limes, chestnuts, and in fact almost all the ordinary varieties of forest trees ; but larch, and the kinds first mentioned, are those that are considered to be the most profitable, except at high altitudes, when the Scotch fir must be preferred.

4th, Medium loam, with a clayey subsoil, in glens or sheltered places, is the most suitable for ash. In such situations, it is the most profitable tree that can be grown, as, besides producing a heavy crop if allowed to grow to maturity, it yields a fair revenue during the whole period of its growth, young ash being in great request at all stages. When grown on the granite formation, the wood is more brittle and shorter in the grain than when it is grown on limestone ; but a clayey bottom is preferable to either. As an ornamental tree, the ash grows well at high altitudes and in exposed places ; but under such circumstances, the trunks are invariably short and rough, and consequently the wood is not of so much value as when grown on suitable soils and under favourable conditions. This sort of soil is also suitable for oak, plane, Spanish chestnut, black Italian poplars, beech, elm, silver birch, and Scotch fir ; and, at low altitudes, spruce and willows. In fact, this is one of the soils in which there can scarcely be a mistake made in selecting suitable trees, as, under ordinary circumstances, it will grow to fair dimensions all the common varieties. Of course, there is a difference as to the value of crop; but there is no doubt that the ash, plane, black Italian poplar, larch, silver and Scotch fir are the most remunerative. Poplars and larch being the most rapid growers, attain to a large size on this sort of soil when about fifty or sixty years old.

5th, Heavy loam or clay. This is most common at low altitudes. Oak, ash, elm, and plane are the varieties most commonly met with on this soil, and they all grow to fair sizes and are of good quality, especially the oak and ash, many fine specimens of which are growing on clay soils, and often under very adverse circumstances as to situation. However, as a profitable tree for the growth of which this soil is suitable, the black Italian poplar is the best. It generally contains as many cubic feet of timber at 50 years old as the oak does at 100 years, and the price of poplar per cubic foot is sometimes as high as the oak, but in general it averages about one-fourth less. Owing to the branches of the poplar being wide-spreading and brittle, they are often damaged with the wind when grown in exposed places; but being free and rapid growers, they soon recover their appearance. When grown among other trees the poplar soon overtops the whole, and it is therefore more suitable for growing in

masses than in mixed plantations. To plant this sort of soil successfully, good-sized well-rooted plants must be used, as small plants are always stiff to grow on clay soils; but when once they are fairly established, they grow rapidly.

6th, Sand. Until recently sand was considered to be unsuitable for the growth of anything but bent, but the success that has attended the planting of the Culben Sands, in Morayshire, has proved that sand is capable of growing a fair crop of Scots fir. The Pinaster also grows well on the Continent on sandy soils, and there is no reason why it should not be considered as suitable in this country. The successful growing of Scots fir on sand has been attended with a good deal of expense, but the results have been very encouraging, and such as ought to induce the proprietors of such lands to turn them to some better account than lying waste, exposed, and carried away by almost every wind that blows.

Conclusion.—Such is a description of the soils and subsoils suited for the various species of forest trees, coniferous and hardwood. The conclusions arrived at are the result of careful observation of the different varieties of forest trees under all circumstances. More species could easily have been enumerated, but our study in this report and our object in daily practice is to recommend the varieties from which the largest amount of revenue can be obtained, coupled with the varieties for the growth of which the soil and subsoil is most suitable. We feel that had the nature of the different soils and subsoils been more scientifically described and designated, this report would have been more interesting and readable to the savans of the Highland and Agricultural Society; but we believe that the soils and subsoils, along with the altitudes and situations as described, will be understood by the greater part of those who are interested and engaged in the planting of forest trees, or the management of plantations and wood lands.

ON ENGLISH WATER MEADOWS, AND HOW FAR THEY ARE APPLICABLE TO SCOTLAND.

By David Robie, Bedford.

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What are called meadows in Scotland are different from those known by that name in England. In the former, natural meadows are swampy flats, soaked and often overflowed by water, and yielding a coarse forage, which was at one time the only hay known in Scotland. In England, on the other hand, fields of pasture or hay, whether the spontaneous growth of the land or

not, however dry the ground may be, is held to be a meadow; but indeed the word meadow, in Hants and the adjacent counties where valuable meadows predominate, means only watered grass lands. Many of them bear no marks of the plough, and the plants are just what the situation has produced, the sward having been left entirely to nature's charge. Water meadows have long received the attention of English husbandmen. In the Cromwellian age we find directions for meadow floating, and a Captain Blith describes it in the title page of his book as "one of six pieces of improvement of land;" but we think Columella knew more of water meadows, and saving barndoor toil, as it is quaintly expressed, than our early English writer on agriculture.

It may be best to give a few descriptive particulars of river meadows first, or what may be called *self-flooded meadows*, and then the artificially-irrigated meadows, concluding with some remarks on the water meadows of Scotland.

The river meadows with which we are best acquainted in England are those on the Thames, the Ouse, and the Nene. They are very generally divided between the adjacent farms in every parish, and supply the principal part of the hay crop. The most serious disadvantage connected with them is their low elevation above the summer stream of the rivers, and the consequent liability to the destruction of the crops, the flooding at best being casual and uncertain. These sluggish rivers, not having a flow of more than a mile in two or three hours, do not indeed, when much swelled by rains, have the sweep and turbulence of a Scotch river when roaring in full flood, and may not plough up and desolate the adjoining haughs, but a summer spate causes not unfrequently a serious loss. Sometimes the whole crop is swept away, or rendered useless for provender, and more frequently the aftermath is spoiled. The occupier has thus no control in the laying on or the taking off of the water, and low-lying places are frequently supersaturated and submerged for weeks. Those who have not seen the low lands in a flood would scarcely credit the great inland seas that are formed on the occasion. The finest grasses perish by the protracted immersion, and the mire forming a congenial habitat for marsh plants, herbage of a flaggy and sedgy character takes possession of the soil. Farmers with gravelly and porous meadows favour a prolonged inundation, seeing that it rarely fails in yielding a larger crop.

It is not easy to say how this untoward state of things can be mended, and the evil is becoming aggravated in consequence of the extension of land drainage. The mills, the owners of which stand upon their rights, take up nearly the whole descent of the rivers. The plots of osiers and willows on the banks, not less than the abundant vegetation in the channels, all more or less impede the flow of the river. The intermixture of properties,

and the opposing interests of the owners, are also formidable checks against anything being done in the deepening, widening, and straightening of the river courses. We travelled from Bedford to Olney, a distance of eleven miles by rail, leaving the Great Ouse at Bedford and coming up to it at Olney; but the distance in following the multitudinous curves of the river is 32 miles. It is noteworthy too, that in olden days there were many fords that cannot now be waded over. The soils and subsoils consist mostly of light alluvial and peaty deposits,—mud, clay, and sand carried down from the higher grounds that settle in the eddies, the accumulations of untold centuries. They are naturally fertile, but do not grow crops conformably, as the herbage is of a dwarfish description, and rents range from L.2 to L.4. an acre. If it is asked how the vales along the river courses are so generally used for growing meadow hay, it may be answered briefly because of their insecurity for growing other crops. The tillage farmer knows well that by draining and reclaiming he could grow giant crops on them, and that the soil is of a more manageable description than the untractable clays most prevalent on the adjacent rising grounds.

Before giving the particulars of some meadows with which we are familiar, we may premise that water meadows, where the conditions are at all favourable, never fail as a profitable investment. A deficiency of water, a costly outlay in their formation, or a heavy and impervious clay, will thwart the best schemes. The meadow yields a large quantity of winter provender for the live stock, which adds largely to the manure heap, for the enrichment of the tillage lands. Still it is seldom that we see dry land converted into meadows. The necessity for extending irrigated meadows is indeed less urgent, since the introduction and extension of turnip culture and the other cattle crops, with the artificials to grow them with. It must, however, be granted that the increasing cost of labour has a tendency to direct more attention to the subject, for the cost of management is trifling compared with ploughed land,—as water meadows require neither ploughing, manuring. nor seeding. In none of them have we seen any signs of exhaustion, whatever kind of water is applied,—so good crops may be expected so long as grass grows and water runs.

Water meadows were introduced into Bedfordshire about 80 years ago by a late Duke of Bedford, near Woburn Abbey demesne, under manifestly unfavourable circumstances. The levelling, channeling, and sluicing cost L.8 to L.9 an acre, but there was not a perennial stream within the scene of the first operations. We inspected one meadow of 30 acres in the parish of Maulden, Bedfordshire, which was laid out subsequently. It is occupied under lease from the Duke of Bedford by Mr George Street, who is so well known for his fine Oxford Down sheep.

It is watered by a tributary of the river Ivel, and consists for the most part of a peaty soil with a little sand; in some places the peat is thin, and rests on a loamy substratum. It lies in a greensand district, which is also partly oolitic; and judging from the indifferent character of the adjacent grounds, the space occupied by the meadow had been of little value before it was improved and irrigated. It now affords good sheep and cattle food, and carries good crops of hay. The hay is inferior to the ordinary hays grown on the higher fields, but for winterage use it is superior to the best oat straw. The sheep are put on before the end of March, and pastured down to the middle of May. It is then floated, and the grass is mowed and harvested about the 10th of July. The aftermath affords keep for cattle and sheep down to near Christmas, after which it is irrigated, and as a rule the more water the better the crop. If ewes and lambs are pastured on the meadow in the spring months, the lambs are subject to a complaint called the "rickets," which, affecting as it does their joints, impairs their growth and fattening. Mr Street states that the management of the meadow costs about five shillings an acre. About six acres of this meadow has been laid out in ridge and furrow; and the only other artificial meadows worth noting in the above county lie, the one in Flitwick parish and the other in Sutton, and they are both managed on the ridge and furrow system. The ridges range from eight to twelve yards wide, and the crown is about two feet higher than the furrow. The carriers are about one foot wide, and of the depth required for the volume of water to be conveyed. The surface of the Flitwick meadow was a naked black peat before it was formed for irrigation; but when the water was turned on, the poas and best marsh grasses, never before seen, came away luxuriantly. In favourable seasons, two to three tons of hay are obtained from the acre, besides the spring feed and aftermath, but the hays are rather coarse and benty. Some of the meadow farmers say that if they were laid down with finer grasses, so as to secure better hay, the spring and autumnal feed would be diminished. Muddy water is most esteemed—that is after a fall of rain; and as the meadows exist at present, they are of more value to the farm than corn land; but you cannot definitely assign a comparative value with the land alongside, as they differ materially in their texture and composition. If the question were to be asked at twenty farmers in different localities, twenty different opinions would be given in reply.

But we must go to the south of England to see water meadows in perfection, where they occupy an extended area. They are confined mostly to Wilts, Dorset, Devon, Hants, and Berks. The perennial greenness, freshness, and luxuriance of the artificial meadows in these counties are notable, and they are believed to be

mainly due to the chalk and limestone from which the water is derived. In a few localities the brooks, like the rivers in the East, run dry in summer, but more frequently the streams are perennial. The rains in the porous and cavernous chalk hills are absorbed as they fall, and sinking gradually and constantly to the lower levels where the springs break forth, the flow of water in the rivers is not much greater at one season than another. Hence the channels are rarely flooded, and seldom run dry. Here we meet a striking confirmation of the statements that have lately been advanced by Mr Beardmore of Great George Street, Westminster, in relation to the flow or volume of the rivers in the cretaceous districts of England. By repeated gaugings, extending over twenty years, he has found that though the size of a river is considerably reduced in a summer of great drought, it does not sink to its lowest flow before the autumn months of the succeeding year, unless there is a copious rainfall during the intervening winter. It may be remarked, that there are no great rivers in that land of water meadows, but generally the supply of water is tolerably good. From the tables of the indefatigable Mr Symons, who has spread his network of rain-gauges over the British Isles, we learn that the mean rainfall of these counties, at altitudes of 300 and 400 feet above the sea, is 33 inches annually, but in the dripping year of 1872 at the same stations the rainfall measured 48 inches.

Mr James Rawlence, the noted breeder of Hampshire Down sheep, favours us with a few particulars as to his system of managing water meadows. There are on his farm 106 acres of an irrigation meadow, and he is one of the best authorities on the subject in Wiltshire. He had just began to irrigate his first meadow when we heard from him (October 25th), and expected it to be fit to feed on the first week of March, and feed on till the first week in May. It is then irrigated again, and at the end of six weeks it is ready to be cut for hay. After the hay is carried, the water is put on for a short time, and then it is fed by cattle until the second week in October. It is a common practice in South Wilts to irrigate for three days, and again to lay dry for three days alternately, but the practice depends largely upon the weather or temperature. If the frost is severe, the water is kept upon the forward meadow as long as it can be spared. The meadows in the neighbourhood of Wilton are thrown up in beds with a gradient of 45° to 65°, according to the character of the land; in a clay soil the former, and in a gravel or sandy soil the latter gradient is sufficient. Some foregoing remarks may serve as a description of the *ridge and furrow* meadow; but the natural surface of the *catch meadow* gets no forming, and may be made for two or three pounds an acre, if the cost of drainage is not included. Shallow gutters or carriers are made at a level round the slopes of the uneven ground, tier above tier, with no distinct

channel for carrying off the water. The water, after flowing over from one carrier, is caught by the next, and the ease with which these meadows are formed on brae-set land is notable. The ridge and furrow meadows, on the other hand, having frequently to be formed by the spade, cost in some cases as much as L.20 an acre.

The water meadows in the chalk districts referred to, are famous and invaluable as adjuncts of the farm. The rich and thick growth of early grass, some six or nine inches in length, produced on these meadows, is fed off with ewes and lambs in March and April. The sheep are folded on the meadows during the day, and at night they are driven to a fold of swedes, or rye growing on dry arable land. About July a heavy crop of hay is harvested, say two to three tons an acre, and again after a brief flooding, there is an abundance of grass for cattle and horses till November. Some farmers give oilcake to their cattle when feeding on the aftermath, and with this aid it is fair to anticipate that a half-fat bullock will become prime beef for every acre of meadow consumed. These meadows have natural advantages of no slight agricultural importance. The farmers of the Chalk hills have a succulent food for their ewes and lambs at a time when other foods are scarce, the abundance of the summer hay that quickly follows, the autumnal after feed, and the fertility bestowed upon the adjoining arable land in the manure and folding from the consumption of grass and hay, give a value to them that is fully appreciated by the agriculturists of the district. The water feeds the meadow, the meadow feeds the flock, and the flock manures the arable land. The results are seen in the number of lambs sold, and in the increased production of corn. Truly we may say with the late and honoured Philip Pusey—"A water meadow is the triumph of agricultural art, changing as it does the very seasons." The position of many of these meadows imparts a picturesqueness to the landscape unequalled in England. The narrow vales, with their emerald green meads and crystal waters, are studded with villages, homesteads, and ancient churches that compose quite a charming scene. Some of them are planted as it were on the hump-back of a dromedary, and the tall trees complete a picture that would demand the descriptive powers of a Wordsworth to delineate.

The water meadows of Scotland, like those in England, are situated in hilly districts, and are almost all confined to the south-west of Scotland. Great as is the annual rainfall on the rising grounds inland from the sea-board in those western parts, the farmer is not content with what pours down from the clouds, but wherever the descent of a burn can be commanded, its waters are diverted from their course, and poured in a great and continuous flow over the selected ground. Their copiousness increases

the weight of the crops, but makes the hay all the more rough and unpalatable. Naturally the meadows are for the most part wet and *over-shoe*, and in consequence are charged with noxious water in the subsoil. The plants and herbage, as may be inferred, consist mostly of semi-aquatics—such as vernal stargrass, sweet vernal grass, sprits, rushes and marsh marigold. Where drainage has been more or less carried out, Timothy or catstail grass has been grown with great advantage. It produces a heavy crop, and is highly nutritious either as a forage or pasture plant. It does not appear to have become appreciated according to its value on the south side of the Tweed, and we believe Scotland possesses a better strain of it. The botanical name is somewhat meaningless, and may have led to mistakes.

Water has been styled weak liquid manure, but the water from healthy moorland wastes, sterile upland ground, and deep peaty bogs where it may have remained stagnant for long periods, if not positively noxious, has little fertilising power, and such is the character of much of the waters among the little hills of Renfrewshire. Still water meadows are a part of the creed of the dairy farmer of the west; pastoral husbandry is more of an industry than corn-land, the meadows are the most profitable acres on the farm, and the "bog-hay" is a valuable acquisition for winter provender to the dairy stock. It is harvested in July, and carried in August from the tramp cole before the commencement of the corn harvest. Part of this hay is passed through the chaff-cutter; it is then boiled along with turnips, and with the addition of a little bean meal, it is served up as a mash to the dairy cows. The vales where the meadows abound are naturally fertile, having been "water-fed" for periods no saying how long, and as much as four tons of hay an acre have been obtained from the best of them in favourable seasons.

The above is by no means an encouraging picture of the meadows of the west of Scotland, but we must say in truth it is only descriptive of the worst classes, for there are many improving farmers who have drained out the sour water, and put a better face on them. The irregularity and brae-set condition of many of them, requiring as they do a heavy expenditure in drainage and other requirements, are too costly, we would say, for a tenant with the security of a nineteen years' lease. We improved a small part of a meadow we owned in Renfrewshire, and our successor in the farm was advised by a skilful farmer in that neighbourhood to drain and reclaim another piece of marshy ground and convert it into a meadow. The cost in both cases amounted to about L.24 an acre, which, including the purchase-price of the land, would not repay itself in a lifetime. On the same property we had a pond of stagnant water four feet deep, from which there was no outfall. We quarried a hard flinty rock

adjacent, and filled it up to the level of the water. The stones were then covered with a foot of earth, to which was applied a dressing of hydrate of lime, and finally sown down with Timothy grass. The water was rich in animalcules, and the grass at once responded in repeated cuttings for house soiling. This improvement cost at the rate of L.70 an acre, and would not have been undertaken but for its proximity to the farm buildings. The springs in that district are rich in salts of iron and magnesia, and they well up from unknown depths of the trap rock, which underlies the soil in that countryside.

At Milliken, in the same county, a dry land field was converted into a capital water meadow some years since by Mr Glegg, the agent on that and other estates in the vicinity. He diverted a considerable rivulet from its channel, and laid the water on a field which was lying in grass, and which had been sown with rye-grass and red and white clovers a number of years before. Fescue grasses and Yorkshire fog had largely usurped the place of the sown grasses, and the soil itself was of a medium mixed quality, and not specially in want of drainage. The water was carried through a culvert, and the main carrier swept round the field at the flowing-water level. The excavated earth from this carrier was banked up on the lower side, and the water passed through the mound in pipe tiles at short intervals, from whence it trickled over the ground without very much catchwork. Encouraged by success at the very outset, Mr Glegg set about flooding another field from the same burn, the two measuring some 16 or 18 acres, the whole expenditure very little exceeded one hundred pounds, and the annual cost of management amounts to half-a-crown an acre. The annual produce is about four tons an acre, and the value about 80s. per ton. Mr Glegg estimates the increased value of the irrigated land at ten pounds an acre over the adjoining lands. In order to improve the quality of the hay and augment the crops, he has persevered in sowing Timothy seeds both in May and in August, and it is now the principal grass. He farther says that Timothy is very beneficial, on account of its bulk and the strength of its stems, which support and keep up the other grasses. It has also another very important advantage in being very easily harvested, for even during broken weather there is not much difficulty in getting the hay cured in that moist district of country. The rivulet from which the water is drawn has the advantage of being diluted with the dirty water from a village at no great distance, which partly accounts for the success attained. It is not uninstructive to note that the sediment from a lake in the vicinity of the meadows through which the rivulet passes has little fertilising power—a proof, if proof were wanted, of the unprofitableness of attempting what has been often tried, namely, the utilisation of the solid matter

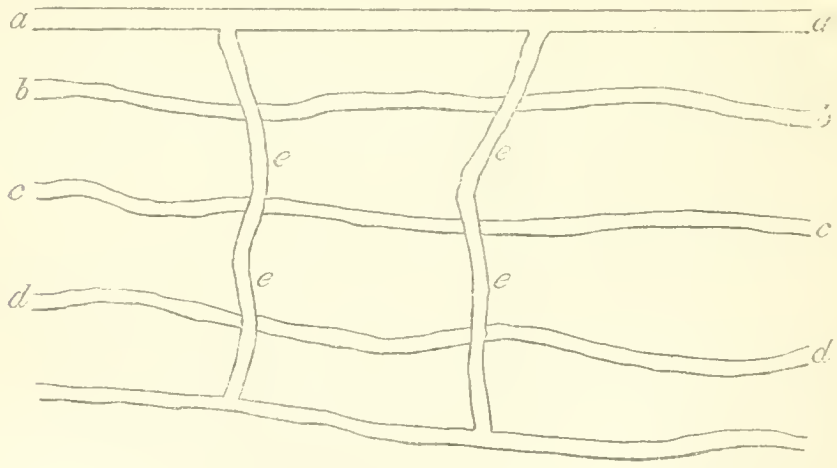
of sewage by separating it from the liquid. The water in the burn referred to passes direct to the pond, without irrigation for a number of months every year.

It is not easy to say how far the meadow system as practised in the best district of England, where grapes are annually grown in the open air, can be advantageously adopted in Scotland. Formidable obstacles stand in the way, the cost and difficulties of drainage, the inclemency of the climate, the inferiority of the water, and the closeness of the meadow soils, are all elements that must be encountered, and more or less surmounted. It is well known that in the march of improvement the climate of Scotland has been gradually ameliorated, for 150 years ago Scotland had the repute of being a land of famine. Where extensive districts consisted of trackless upland deserts and wastes, marshes and bogs, early improvers met with only partial success. We have seen reputable land in the vicinity of the great bogs towards the west of Ireland, having an atmosphere constantly loaded with vapour, which had to be consigned to grass mowing, as the only profitable style of occupancy, but which would have been good corn land under more favourable conditions. In the west of Scotland, where dairying and meadowing are associated with almost every farm, the annual rainfall is seldom under four feet; this to some extent is an index of climate, and though many of the English meadows stand at a considerable elevation above sea-level, higher in many cases than the western meadows of Scotland, still the latter will not compare advantageously with England as regards climate. This has been disputed, but the inferiority of the cereal crops in the dairy districts referred to, and the lateness and precariousness of the harvests, clearly prove the vast superiority of the English climate.

But with all these drawbacks, we do not despair of seeing an extension of water meadows in Scotland, in the vales, and up the slopes of the dry hills. The "moss-crap" of the hills in their natural state is the first relief in the spring for the flocks of the storemaster, and were artificial means resorted to, an earlier and a larger bite of herbage might be produced. Many of the Grampian Hills might be greatly improved by utilising the burns that flow down their slopes, where there is an ordinary depth of earth, and where they are not greatly encumbered with stones. No person can have failed to observe that where springs break out from the sides of the mountains, they have extinguished heath, and raised green grass on all the lower ground over which they have spread. These tiny streams could be conducted by horizontal ruts along the sides of the hills, and in their downward trickling, the heather would disappear, and a mantle of green herbage would take its place. The opinion has been advanced that with a favourable exposure, such an improvement might be

profitably executed if the altitude does not exceed 1500 feet above the level of the sea. We do not say that hay could be grown on their rough heathy sides, but could an earlier and richer herbage be produced, it would meet a clamant want of the flockmaster. So there is an unlimited field for improvement in the north, and the industry and unwearied exertions of the Scotch seem to be all the more, the greater the difficulties—just like the brave sea-bird which holds its healthiest play when the angry waves rise the highest.

In conclusion, we subjoin a diagram with some descriptive particulars of Bickford's system of distributing water over a meadow. Generally flooders and meadow farmers are self-taught, because the mode of formation and management are mostly self-evident, and very much, so to speak, a matter of instinct. We have seen meadows perfectly flooded, and the water equally diffused over every inequality of surface, by an ingenious man with a good eye, in every respect equal to the plan laid down; but as advantages are claimed for his mode of carriers, and shallow distributing gutters, feeders and catch work, an epitome of the details may be useful. The system we think is best expounded by Sir S. H. Northcote in the 29th No. of the "Journal of the Royal Agricultural Society of England," 1852, and which is illustrated in the following diagram:—



The carriage gutter *aa* is cut along the line of the highest ground, and its width and depth are regulated according to the volume of water intended to be conveyed. It is guided in its direction conformable to the inequalities of the gound, and the flow of the water. Next a small catch gutter *bb* is cut below without any fall from one end to the other; *cc* and *dd* are made similar to *bb*, and the wavings in these lines are constructed for running the water out of the low places, and on upon the high places,—thus giving the water a drop to the heights. The catch

gutters may be made about four inches wide, and one to four deep. These cross the line of fall, and prevent the water from running down the hollows to the bottom of the meadow. When the carriage gutter *aa* is filled, the water is made to flow over at all places equally, and the catch below again redistributes it over irregularities. When there is much sediment lodging in the highest portions of the meadow, the transverse gutters *ee* can be utilised for conveying the water to any of the catches at pleasure without touching the intermediate spaces. By means of these arrangements the water can be turned off or on with ease and despatch. The peculiar merit of the system is in these level catches, and it is generally pronounced both efficient and economical.

ON THE MANAGEMENT OF GRASS LANDS IN ENGLAND.

By Gilbert Murray, Elvaston Estate Office, Derby.

[*Premium—Ten Sovereigns.*]

The high prices of every description of live stock, and the growing expense and difficulty of obtaining a regular staff of farm labourers, are inducing the English farmer to turn his attention to laying down more land to grass. Throughout the counties of Northampton and Leicester there is a considerable extent of red soils more or less of an open character, resting on the ferruginous sands and sandstones of the lower oolite. The formation is for the most slightly undulating in character, the soil on the upper parts is often shallow, and though well adapted to the growth of roots and cereals, it makes inferior grass land. On many farms there is a considerable area of bottom land adjoining the brooks and valleys: here the soil is of a deep adhesive nature, difficult to cultivate, and uncertain as to the quantity and quality of the produce. In wet seasons the straw is rank and flaggy, and the corn lean and of light weight per bushel. Nearly the whole of this land is now being laid down to permanent pasture. Owing to the insecurity of tenure and the want of a well-defined tenant-right in many instances, where landlords were disinclined to assist in the expenditure, sufficient attention has not been given to the preparation of the land—the selection of seeds and subsequent management. With the exception of the fen and rich alluvial meadows abutting the rivers, nearly all the upland permanent pastures of the Midland Counties of England have at one time or other been under arable culture. We learn from old documents and oral tradition that a large extent had been laid down from eighty to a hundred years ago. A few weeks since we were over a farm situated on the Keuper Marl at an elevation of 265 feet, and we were informed by the tenant that about 50

acres of permanent pasture was laid down by his father sixty-five years ago. This is now good feeding land, worth 50s. an acre rental, whilst the adjoining land of similar character, still under arable culture, is fairly rented at 38s. The best grazing lands of the Midland Counties are those of the middle oolite and Oxford clays. All the strongest lands are grazed by oxen or steers. Shorthorns, Herefords, Devons, North and South Wales runts, have each their special admirers; in fact, from long practical experience, the farmer finds that different farms are suited to particular breeds, and even different fields on the same occupation pay better when grazed by one particular breed than they do with any other. A large number of the best farms in Leicester and Northampton shires are mixed occupations, that is, part arable and part grass. This is the most profitable, as straw and turnips can be grown for wintering at least a part of the cattle required to stock the pastures during the summer. The farms as a rule are not large, varying from 200 to 300 acres. The arable land is generally managed on the five-course rotation—1, wheat; 2, barley; 3, roots, a fourth of which is drawn off and consumed in the yards with cattle, the other three-fourths are consumed on the land by sheep with commonly ½ lb. of linseed cake per head a-day; 4, barley, seeded with broad clovers, or a mixture of ryegrass and trefoil; 5, seeds, mown early, and afterwards grazed with sheep till the middle or end of September, when they are broken up for wheat. All the best farmers use a dressing of 3 to 4 cwt. per acre of artificial manure for barley, after wheat. The land is smashed up with the steam-cultivator as early in the autumn as circumstances will permit; it derives great benefit from exposure to the winter frosts. The land receives one shallow ploughing at spring to bury and destroy the annual weeds. The seed is usually drilled at the rate of 2½ bushels per acre from the middle of January to the middle of April, according to the state of the weather. Early sowing always answers best. On land in high manurial condition the produce is stronger in the straw, and the grain usually of finer quality, under this system all the finest barleys in the Midland Counties are now grown. The great advantage of the five-course shift to the grazier is the extra quantity of straw he produces, enabling him to winter a greater number of stock. On most farms the grass land varies from rich feeding pasture to ordinary store land, fitted only for the breeding flock and young growing cattle. On the majority of grazing farms the rents are too high, if used for breeding and rearing cattle, hence the stock is purchased as required. The grazier generally begins to buy in lean two to two and a-half year old steers about midsummer. Those are run thickly on the store pastures, and are drafted on the best land as the fat beasts are disposed of. A great point with the grazier is to have

the land completely cleared of fog or old grass by November, every tuft and rough bunch eaten down completely bare, and all sour and unpalatable patches mown, by this means the growth of weeds and rank grasses are discouraged, and the pastures gradually improved. During the summer months it is part of the duties of the shepherd to collect the droppings of the cattle from the shade of the trees or hedges, and either place them in a heap for future use, or at once carefully spread them on the weakest part of the field. Every pasture field is gone over at least once a month during the summer, and all the droppings or clots knocked and spread. On some farms a few Welsh runts are wintered out. In severe weather they receive a foddering of rough hay twice a-day; on others, where the land is principally in grass, open sheds with yards attached are placed in the different fields; the cattle are daily foddered in the sheds, and have the run of the fields during the day. Except on very sound old pasture, this system is objectionable in wet seasons, as the land is much injured by the trampling of the cattle. On mixed occupations the stock is all wintered in straw-yards, surrounded by open sheds furnished with mangers to hold artificial food. Both linseed and cotton cake are largely used with straw. We prefer the former, as it tends to keep the animals in a more healthy condition. The usual allowance of cake is 4 lbs. per head per diem. Turnips are now little used for store cattle, owing to the high rate of labour. On large tillage farms with little grass land, cattle are taken in to winter. The grazier finds linseed cake at the rate of 4 lbs. per head per day, the tillage farm supplying the straw and attendance. We have tried ground barley instead of oilcake, cutting the straw into chaff and mixing with the barley meal. In this way the straw is economised, but the cost of labour is greatly enhanced. The heating nature of the barley is another great objection. Cattle wintered on barley meal invariably rub off most of their hair when turned out to grass, and should cold weather set in they soon deteriorate in value to a considerable extent. Cattle wintered on cake never loose their hair when turned out. The best graziers seldom feed any cows or heifers; if they do so, they are careful to keep them entirely by themselves. If in the same field with bullocks, they unsettle them, and when bulling they are often the source of accident and loss. On the best land oxen pay best, one bullock and a sheep per Imperial acre is sufficient stock for the finest land. The beasts are turned on the pastures from the 1st to the 20th of May, according as the season is backward or early. The rent of the best land varies from 50s to 70s per acre. Cattle bought in at May-day will go off fat between August and October, and leave on an average L.5 per head for their keep.

As a rule, graziers use no artificial manures on their grass

lands; some, however, use considerable quantities of cotton and rape cake. This tends to considerably improve the pastures, at the same time it enables the farmer to make a greater quantity of meat per acre. In these times of high prices of meat, the farmer cannot err by using large quantities of artificial foods. The great bane of the English grazier is the heavy losses he sustains from diseases which prostrate and destroy his stock. During the present autumn I have seen cattle fit for the butcher, attacked by foot and mouth disease, decrease L.3 per head in value during the short period of a fortnight; and it is impossible that they can recover their former stage at grass this season, the country calls urgently for more stringent regulations as to the removal of cattle. Experienced graziers are first-rate judges of a lean beast. They carefully select and purchase their own stock. Some of the large graziers attend the London market weekly from June to Christmas, and sell their own cattle; others intrust them to the hands of salesmen. The money is all paid through bankers, and the farmer always receives his returns by the following morning's post. On the best land a sheep to the acre is generally wintered. These are mostly lean yearling wethers, purchased about the beginning of November. Most farmers give ½ lb. per day of linseed or cotton cake from the first of January. They are shorn and sold off to the butcher by May-day, and generally leave one pound a-head for the six months' keep. We may mention some of the best grazing lands with which we are acquainted in the Midland Counties:—Buckinghamshire, Creslow, on the upper oolite, and its junction with the green sand; Warwickshire, Wormleighton on the lias; Northampton, Faxton, Cottesbrook, and Clipstone on the lower oolite; Leicestershire, Kibworth, and Lutterworth on the lias, and Market Harborough on the lower oolite. The most productive pastures with which we are acquainted are to be found on the deep alluvial loams of the valley of the Dove, the Derwent, and the Trent, in Derbyshire. The soil is a mixture of various materials derived from the abrasion of the trap, mountain limestone, millstone grit, and other formations. These materials have been washed down by the floods of centuries, and are yearly fertilised by new deposits. The soil varies from two to six feet in depth. The quantity of grass some of the best fields produced is immense. Only lately we valued some of this land for rental—one field we put at L.6, and others at L.3 per acre. The principal grasses are *Alopecurus pratensis,* meadow foxtail; *Poa trivialis,* rough stalked meadow grass; and *Dactylis glomerata,* rough cocksfoot. This soil is best adapted for dairy purposes. The quantity of milk it produces is enormous. Some of the best fields are used for fattening cows or heifers. These get fat upon it, yet the pastures are weak compared to those of the oolite or lias series,

and quite incapable of finishing off heavy oxen. Our experience of laying down new and improving old pastures on a scale of some magnitude has been acquired principally in the Midland and Southern Counties of England. In converting tillage land into grass, the first and most important point is the preparation of the soil. On this, in great measure, depends the success or failure of the undertaking. The land should be clean, finely commuted, and rich in manurial condition. Some difference of opinion exists amongst practical men as to whether the seeds should be sown with or without a corn crop. This depends greatly on the soil, elevation, and rainfall of the locality. On light soils situated in a dry climate, one bushel of oats or barley should be sown broadcast with the grass seeds at spring; oats are to be preferred, they soon spring up, and afford a protecting shade to the young and tender seeds. The crop is best mown before the oats become fully ripe, and should be removed from the land as soon as practicable, as they are apt to destroy the seedling plants. The following detailed exposition of the system we have successfully adopted for several years may be of interest to the reader.

On light and medium soils, when the root crops can be eaten on the land by sheep, without injury to the soil by treading, we take a crop of white turnips, sown the end of June or beginning of July, after the land has been thoroughly cleaned, applying a dressing of 15 to 21 horse cart-loads of well-rotten farm-yard manure, and 3 cwt. of specially prepared phosphatic manure per acre. The whole of the root crop is consumed on the land by sheep, which, in addition to the turnips, receive ½ lb. each per day of linseed cake; this leaves the land in good condition. On the Bagshot Sand, in the county of Berks—a poor weak sand—we took two root crops in succession, and consumed the entire crops on the land by sheep before laying down to grass. The seeds were sown without a crop, and the result proved most satisfactory, considering the quality of the soil. On light soils the land should receive a shallow ploughing as soon as the roots are eaten off to prevent any loss from evaporation; the plough should follow close up to the fold. On the strong adhesive soils of the oolite and lias, or the London and Oxford clays, this system of management is impracticable, as the roots cannot be consumed on the land in ordinary seasons without injury to the soil. On this description of land we dispense with the root crop, and depend entirely on farm-yard and artificial manures to supply the necessary manurial elements to the soil. Various opinions obtain as to whether spring or summer is the best time for the sowing of permanent grass seeds. Our experience in the Midland and Southern Counties of England leads us to prefer sowing strong land in the month of July, without a corn crop, and light lands as early in the spring as the work can be satisfactorily accom-

plished, and with, say, one bushel of oats or barley per acre. Strong land under tillage, and intended to be laid down to permanent pasture, should be deeply broken up early in the autumn, and if possible whilst the soil is dry.

Steam cultivation now affords an effective means of thoroughly accomplishing this object. The soil, from being deeply stirred and left in a rough state, derives great benefit from the ameliorating influences of frost and other climatic changes during the winter months. During the spring and early summer the soil is further stirred and thoroughly pulverised and all root weeds completely destroyed. About the end of June a dressing of well-rotted farm-yard manure is spread equally over the surface, and covered in with a shallow furrow. We find that clover and grass seeds always vegetate and succeed best on a firm seed-bed, hence we pass Croskill's clod-crusher over the land before sowing the seeds. This operation effects two important purposes. It consolidates the soil and leaves a uniformly level seed-bed, which prevents the tiny seeds from being buried too deep in the soil. Clover and grass seeds are sown more evenly by the seed barrow than it is possible to sow them by hand. The barrow can be set to sow any quantity either of clovers or grasses. We always pay 1d. per acre for each time over. We invariably sow the grass and clovers separately; the grass seeds are sown twice, half the quantity is sown by passing the barrow lengthways and the other half by passing across the ridges; this prevents any of the land being missed. The clovers are sown at one operation. We need not say that in sowing light seeds it is best to choose a still day. The seeds are covered by one stroke either of a light chain harrow or a harrow made of white thorn or other brush. If the soil is quite dry, a light roll follows the harrow and completes the operation. The best time to lay down strong land without a crop depends to some extent on locality, but more particularly on the season. In the Midland Counties the best results are usually obtained by sowing from the 1st to the middle of July. In ordinary seasons the land will be well clothed before the winter sets in, and the young plants suffer little from frost. Unquestionably by far the best system of management the first year is that of folding the land with sheep, as is generally practised in the south of England. The pen is changed daily; in this way the grass is not only eaten off level, but the land derives great benefit from the droppings of the sheep being evenly deposited over it. To obtain the best results the sheep should receive a daily allowance of $\frac{1}{2}$ lb. per head of good linseed cake. In Scotland we know this system would be difficult to carry out. We would still recommend the grazing with sheep the first year, and a free use of the scythe to keep the pasture level and free from bunches or rank spots.

A top-dressing of well-rotted farm-yard manure should be given in the autumn at the rate of 10 or 12 cart-loads per acre, and the land afterwards well chain-harrowed; should this be impracticable, a dressing of artificial manures, consisting of 1½ cwt. nitrate of soda, 2½ cwt. of superphosphate, and 3 cwt. of kainit per acre, should be applied about the end of September.

In laying down light lands we prefer sowing the grass seeds along with a corn crop early in spring. The after management should be the same as has already been described. Thorough drainage is the foundation of every agricultural improvement, and we are assuming that the land to be laid down is either naturally dry or has been made so artificially. A great extent of grass land both in England and Scotland in its present state is producing a very poor return in the shape of meat or milk, but much of it, by a judicious expenditure of capital and skill, is capable of doubling its produce. The first step is to remove the superfluous water, followed by the application of lime or artificial manures, which we frequently see producing magical results. In some cases it is necessary to break up the land if intended to be at once laid down to grasses. Again: In the Midland Counties we prefer paring and burning the old turf from the surface and spreading the ashes over the land. In some parts of Scotland the climate might be unfavourable, but throughout the greater part of the Lowlands there would be little difficulty in carrying out this plan. The steam-cultivator now furnishes us with a cheap and effective means of deeply stirring and thoroughly pulverising the soil. The paring and burning can only be successfully done during the summer months; the land is deeply stirred by the digger or steam-cultivator, and in this state left exposed to the frosts of winter. In spring it is easily pulverised and reduced to a fine tilth. If the soil is of a strong adhesive character and would be permanently injured by the treading of sheep throughout the winter, then a crop of white turnips must be sown early in May. These will be ready to stock by the 1st of September. The whole should be eaten on the land by sheep, which in addition to the turnips must have a liberal allowance of oilcake; the land would then be in good condition, and should be seeded down in spring with a thinly-sown corn crop. If deemed too expensive or undesirable to grow a turnip crop, the surface soil could be pared and burnt, and the land cultivated and seeded down without a crop by the middle of August of the same year.

It is often desirable to renovate old pastures as well as to lay down new ones. In 1866 a field of 40 acres of old grass came into our hands; the tenant who had occupied it for many years at a rent of 38s. per acre complained that he had lost heavily by it, and unless a considerable reduction was made in the rent

he must give it up. We took it in hand at Lady-day 1866. The soil is a deep loam on the lower alluvial plain of the Derwent Valley in Derbyshire. On the outskirts of the field is an artificial lake several acres in extent, which drains its water supply from the river Derwent. The town of Derby, with its 60,000 inhabitants, is situated four miles higher up the Derwent, into which the whole of the town sewers empty. No doubt a considerable quantity of feculent matter is carried down by the water and deposited in this lake. In the summer of 1864 the lake was cleared of mud, the accumulation of years, and the mud was carted into large heaps. During the summer we had those heaps turned over and mixed with a large quantity of unslaked lime from the kiln, and the heaps were again twice turned at intervals of three weeks. Care was taken to thoroughly mix the lime with the mud and soil. The quantity of lime used was 85 tons, being a little over 2 tons per acre. The land was eaten bare, and the top-dressing spread evenly over the field. About the end of February and early in March advantage was taken of the drying winds to use the heavy roller and chain harrows freely, and the lime and soil well worked into the land. All loose stones were next collected and carted off; no new seeds were sown. The pasture showed a marked improvement the first summer. The second spring we were offered a rent of L.4 per acre for it by a cattle dealer in the neighbourhood. It has ever since been grazed with a herd of shorthorn dairy cows and occasionally a few sheep. Instead of falling off it continues to improve. The whole field is closely covered with a thick carpet of clovers and the finer varieties of natural grasses, and since the first year, after top-dressing, it has never kept less than one cow per acre from the middle of May to the end of September. The entire cost of the whole operation, including lime, manual and horse labour, was L.3 per acre. The land is well drained, it is situated at an elevation of 165 feet, and the mean rainfall is 26 inches.

During the year 1852 and two following years, we assisted in laying down in permanent pasture a considerable area on the Berkshire estate of J. J. Wheble, Esq. The soil is on the Bagshot Sand formation, which, under arable culture, was highly rented at 20s. per acre. Good crops of roots were grown by the aid of farm-yard and artificial manures, and the whole of the roots were consumed on the land by sheep; the seeds were sown without a corn crop. The seeds were supplied by Messrs Sutton and Sons, Reading, and consisted of the following mixtures:—

Sweet vernal,	1 lbs.	Hard fescue,	2 lbs.
Creeping bent,	1 „	Sheep fescue,	1 „
Crested dogstail,	4 „	Sutton's perennial ryegrass,	8 „
Rough cocksfoot,	4 „	Pacey's ryegrass,	8 „

Evergreen ryegrass,	8	lbs.	Perennial white clover, 3 lbs.
Evergreen meadow grass,	1	„	Cow grass, 2 „
Birdsfoot trefoil,	½	„	Alsike clover, 1 „
Yellow trefoil,	1	„	Yellow suckling clover, 1 „
Sheep parsley,	½	„	

The seeds were mown early the first summer, and folded with sheep during the month of August. The second year the land was well covered with grasses and clovers. Under the best management the soil was too weak and inferior ever to produce more than an ordinary store pasture. The third year we considered the land worth a rental of 26s. per acre. In a few years the clovers, and some of the finer varieties of grasses are apt to die out on such soils.

In the year 1862, was seeded down some land in the parish of Great Billing, in the county of Northampton. The soil was a heavy, retentive loam, resting on the lias formation, which, under arable culture, was worth 28s. per acre. The land, a wheat stubble, was deeply ploughed during the month of October. In this state it lay undisturbed till the following March, when it was again deeply stirred with the plough, after being thoroughly cleaned and pulverised. During the summer it was sown with white turnips. The first week in July the turnips were all eaten on the land by sheep, and were finished off about the end of November. The land was closely ploughed up behind the sheep; 3 bushels of oats were drilled, 9 inches apart, and the seeds sown early in March. The seeds planted well and grew vigorously. They were not stocked after harvest, nor until the following April, when they were folded off with fattening wethers, eating half-a-pound of linseed cake daily. As soon afterwards as they had made a sufficient growth they were stocked with young cattle. The seeds were supplied by Sutton and Sons, Reading, and consisted of the following mixtures:—

Meadow foxtail,	1¾	lbs.	Darnel-leaved fescue, 1 lbs.
Creeping bent,	1	„	Sutton's perennial ryegrass, 9 „
Crested dogstail,	3	„	Pacey's perennial ryegrass, 9 „
Rough cocksfoot,	5	„	Timothy, 3 „
Hard fescue,	3	„	Smooth-stalked meadow grass, 2 „
Meadow fescue,	2	„	Yellow trefoil, 1 „
Fine-leaved fescue,	1½	„	Perennial white clover, 2 „

The third year the land was worth a rent of 40s. per acre, and continues steadily to increase in value. Down to the present time the elevation is 250 feet, and the rainfall 23 inches.

During the last six years a considerable area of land has been laid down to permanent pasture on estates under our management. A detailed description of one field on each of the different geological formations, which has come within the range of our practice, will suffice as an illustration of our experience. I may

here state that, acting as the agent of a large proprietor on whose estates the farms are all held under yearly tenancies, when I consider the letting value of the farm will be increased, and the land in a suitable state as to condition and cleanliness, the landlord pays for the seeds, and the tenant is at the expense of the necessary manures and cultivation. In the spring of 1871, a field in the occupation of Mr W. J. Sketchley, situated in the hamlet of Amberston, in the county of Derby, was laid down to permanent pasture. The soil, a red, sticky clay, belonging to the Keuper Marl series of the New Red Sandstone, under arable culture, was quite unfit for the growth of roots. Wheat, beans, and oats, succeeded by a naked fallow, was the usual rotation. In 1869 we valued the land for rental at 26s. per acre. This land was summer fallowed and limed, and seeded down with an oat crop. The seeds were purchased of Messrs F. and A. Dickson of Chester, and consisted of the following mixtures:—

Meadow foxtail,	2 lbs.	Pacey's perennial ryegrass,	10 lbs.
Sweet vernal,	1 „	Timothy,	4 „
Crested dogstail,	3 „	Smooth-stalked meadow grass,	2 „
Rough cocksfoot,	3 „	Yellow trefoil,	½ „
Hard fescue,	2 „	Perennial white clover,	2 „
Sheep fescue,	2 „	Cow grass,	3 „
Darnel-leaved fescue,	2 „	Alsike clover,	3 „
Dickson's perennial ryegrass,	8 „		

During the first year the young seeds were weak and puny. They were mown the first week in June, and afterwards stocked with cattle, but carried very little stock that year. During the third year the land had so far improved as to be worth a rental of 32s. It continued slowly to improve; yet it is still far from being a good pasture. The elevation is 265 feet, and the average rainfall 27 inches.

On an adjoining farm a 20 acre field of similar quality and character of soil, resting on the same formation, was laid down by the present tenant. He tells me the land was summer fallowed, and limed and seeded down about midsummer without a corn crop. He is entirely ignorant as to the kinds and quantities of the seeds sown, they having been furnished by Messrs T. B. Gibbs and Co., Half-Moon Street, Piccadilly, London, to whom a description of the land was sent; and the selection has proved very suitable. The tenant tells me that the land, when under the plough, was dear at 23s. per acre; the present rent is 55s. I believe for the first three or four years after seeding down it kept very little stock. It has never been top-dressed, either with farm-yard or artificial manures. For a number of years sheep, eating linseed cake or corn, have been wintered upon it.

On a farm in the occupation of Mr William Harriman, situated

in the parish of Sawley, in the county of Derby, the soil is a gravelly loam resting on the upper alluvium of the Trent valley. A considerable extent of land has been laid down during the last five years. Although a good turnip soil, the tenant, who belongs to the old school, has a great aversion to the growth of green crops. The Derby and Nottingham Canal passes through the farm, which affords great facilities for obtaining town manure at a cheap rate. The system of three white crops and a fallow has been strictly followed for generations. Hitherto very little stock has been kept on the farm, and the fertility of the soil has been chiefly dependent on town manure; but it is by no means in a high state of cultivation. The average rental of this farm is 45s. per acre. The tenant is unwilling to lose a corn crop, hence the seeds have all been sown in spring, either along with a crop of barley or oats, after a summer fallow. The young seeds are mown the first year, and afterwards lightly grazed by cattle. On this class of soil a thick sward is soon formed, and so early as the second year, if a moist one, a large quantity of keep is produced. Here top-dressing with farm-yard or artificial manures is a profitable investment. Without artificial manures the third year the rental value is generally increased from 3s. to 5s. per acre. The seeds used on this farm have all been furnished by Messrs F. and A. Dickson of Chester. The following is a list of the varieties and quantities of each :—

Meadow foxtail,	3 lbs.	Evergreen ryegrass,	8 lbs.
Sweet vernal,	1 „	Timothy,	4 „
Crested dogstail,	2 „	Smooth-stalked meadow grass,	1 „
Rough cocksfoot,	4 „	Rough-stalked meadow grass,	2 „
Hard fescue,	3 „	Wood meadow grass,	1 „
Various-leaved fescue,	1 „	Evergreen meadow grass,	1 „
Meadow fescue,	2 „	Yellow trefoil,	1 „
Sheep fescue,	2 „	Perennial white clover,	2 „
Red fescue,	1 „	Cow grass,	3 „
Fine-leaved fescue,	2 „	Alsike clover,	3 „
Dickson's perennial ryegrass,	8 „		

The elevation of the land is 170 feet, and the average rainfall 26 inches. I purpose to lay down only one-fifth of this farm, as, under any circumstances, it never can make good feeding pastures. It will only be useful dairy or store land; and, under good management, it will pay much better under a rotation of crops.

On a large estate in East Cheshire, of which we have the management, the alternate system of husbandry is chiefly practised. The land is broken up from grass, and after a double rotation of cropping is again seeded down. The rotation is—1st, oats; 2d, potatoes (for which a good dressing of farm-yard or town manure is used, and 3 or 4 cwt. per acre of light manures are applied); 3d, wheat, and the land seeded down

with ryegrass and red clovers; 4th, mown in June, and afterwards grazed with dairy cows; 5th, oats grown by the aid of artificial manures; 6th, potatoes or turnips, manured with farmyard and artificials; 7th, wheat, seeded down to permanent pastures, with a large quantity of common and perennial ryegrass, along with a mixture of red and white clovers, and a small quantity of some of the more common varieties of natural grasses. The land is invariably mown for hay the first year, and afterwards grazed by dairy cows, very few sheep being kept in this part of the country. The soil is a light sandy loam resting on the New Red Sandstone formation, and cheaply rented at an average of 30s. per acre. Some of the best farmers apply a dressing of 8 to 10 cwt. of prepared bones to the young seeds the second year. This produces a magical effect; it is not uncommon to see land increase in value 20s. an acre the third year, after which the ryegrass and clovers become exhausted and die out, and the pastures rapidly decrease in value until the same operation is again repeated. The Cheshire farmers maintain that the rapid falling off of the pastures is entirely owing to the natural effects of soil and climate. This we deny. The soil, already exhausted by a scourging system of cropping, is laid down with a short-lived variety of seeds; any selection of seeds suited to the soil and climate is completely ignored. A great fault in the strata passes through this estate. It runs from north-east to south-west for a distance of 5 miles. On the north-west is the New Red Sandstone plain of Cheshire, which is here at an elevation of 300 to 400 feet, whilst on the south-east the Yordale rocks and millstone grit make their appearance. This part of the estate has a northern exposure, and gradually rises from 350 to 1050 feet. All the lower portion, up to a well-defined line at an altitude of 500 feet, is covered with glacial drift, "Scotch till"; this is principally in old pasture. Though situated at the same elevation, and similar as to temperature and rainfall, the seeds progress more slowly than on the New Red Sandstone, yet, under good management, they continue steadily to improve. Only a few years ago some of this land, in its then unimproved state, and under tillage, was dear at 15s. per acre; the same land, drained 4 feet deep, limed, and laid down to pasture, is now worth 35s. Our experience leads us to the conviction that geological formation exercises a greater influence on the pastures of Great Britain than temperature and rainfall. The most successful instance which we have met with of laying down land to permanent pasture by a tenant holding under yearly tenure, and with no agreement beyond established custom, is that of a farmer situated in South Leicestershire. The soil is an adhesive clay belonging to the lower oolite. Upwards of twenty years ago half the farm was in tillage, and so bad had its reputation

become that a tenant could not be found who would take it at any price. The then proprietor was not inclined to spend much money in improvements; the agent was at his wit's end to know what to do with it, when fortunately a shrewd north countryman turned up and agreed to take it at what he thought a very low rent. After a trial of two years he was compelled to go to the agent and ask for a reduction of rent, otherwise he had determined to give up the farm, and the agent, not knowing what to do with the land, agreed to the tenant's terms. The tenant at once set to work to get the land in condition, which he did at great cost, and laid it down in pasture. On this farm there is land which now fattens a bullock per acre every summer, which, under arable culture, would have ruined any man at a rent of 23s. per acre. The farm has, within the last few years, been revalued and the rent considerably raised, still the tenant does not complain.

ON THE MANAGEMENT OF GRASS LANDS IN ENGLAND.

By David Robie, Bedford.

[*Premium—Ten Sovereigns.*]

In any comparison of the husbandry of England with that of Scotland, there is no feature more noticeable than the great extent of permanent pasture and meadow in the south that is not broken up in rotation. What is ploughed land continues ploughed land, and what is pasture, with rare exceptions, remains pasture. There is a prejudice against breaking up old grass land, which has doubtless arisen partly from the difficulty of insuring a close pile of forage plants and herbage, when it is wished to lay down the land to seeds again for a short permanency; or merely for two or three years' grazing on the Scotch convertible system. Circumstances, indeed, alter cases, and good pastures and good crops are both desirable and profitable. Old grass, when broken up, grows giant crops of corn and roots, and in exceptional cases, heavy clay lands have been ploughed for cropping, and adjacent fields laid down, whereby the revenues of the farm were greatly augmented. Where there are no restrictions on the occupier, the temptation to plough old grass fields is strong, and but for repeating the white crops too often in an injudicious manner, and failing to recruit by manures, the result in not a few cases has been a gain. In driving lately over the Oxford clays of Buckinghamshire, we saw no end of fields, the chief features of which were hassocks, thistles, rushes, spongy wetness, and ant hills; and seeing that tillage farming is making so rapid advances, it is not supposable that fields so unsightly are to remain as they were left us by our forefathers, especially

now that compensation for improvements is recognised by law as permissible (some do hold that *provision* to be all that is implied in the recent Act). It is palpable to the educated eye, who has traversed a few of the English counties, that the improvement of grass land has not kept pace with that of arable land, a circumstance that is probably due to the opinion commonly held, that its improvement leaves less margin for profit.

In laying down arable land to pasture, the difficulty is, as we have said, to procure a good grassy sward in a short space of time, especially on heavy land; but even light, sharp land and mixed soils do not take to grass readily. In speaking lately to Mr Lavender of Biddenham on the subject, he remarked that although he were to sow down his land with the best seeds, the surface would not be closely filled with plants till twenty years had nearly expired. The plants indigenous to the soil would, judging from what we saw, gain the whole and sole possession of the land before that time, whatever kinds might be sown. His lands are on the valley gravel, having a tolerable mixture of loam, and the non-success of grasses and clovers on such soils is a puzzle to those who have been accustomed to convertible husbandry. Some try to explain the anomaly by reference to the mechanical condition of the soil—its density and adhesiveness; and, doubtless, where the soil is strong clay, its compactness and hardness are the greatest barriers to the obtaining of a close bottom, for, as has been truly remarked, the ingredients in its composition for the growth of grasses are not awanting. But the land referred to is of a friable nature, offering every facility for the rootlets pushing their way in all directions in search of food: so in that case the texture of the soils forbids the application of the argument. Others again ascribe it to the climate, but neither of the opinions fully satisfy all the conditions of the problem.

It will suit the design of this paper best to give some particulars descriptive of the conduct of pasture lands, and such experiments as have come under our observation. Respecting the prevailing plants in old pastures, we have frequently in bygone years spent occasional days with Mr Maclaren of Cardington, who, to his acknowledged accomplishments in botany and gardening, has acted as steward on the home farm of C. S. Whitbread, Esq. of Southill and Cardington for the last thirty years. The old meadows on this farm were once the property of the well-known and world-renowned philanthropist, John Howard, and they were undoubtedly old pastures when he was a boy. The arable land had at one time borne an enormous proportion to pasture; but for several centuries the case has been reversed. It is stated respecting the meadow land at Rothamsted, where experiments the most valuable in our day are being carried out,

that it has been in grass for centuries,and the fields in question have been in grass for an unknown period, but they bear the marks of the plough, and having been abandoned to nature, had become covered with the indigenous and native plants that exist more or less in the fields still. The ploughed fields being left in the imperfect tillage of olden times, would soon gather a green mantle around them; but the most of the parks and policies around the seats of the noblemen and gentlemen of Scotland were laid down in a correct and modern style about a hundred years ago, and their aspect does not carry one back to so remote a date as the grazings of England. Trefoil or "Great Claver," and St Foyne (sainfoin), and also lucern are referred to by Capt. Bird in 1653 as great discoveries, the seeds of which were obtained from France and Holland, and they appear to have been fed off and used as forage crops, but mainly for the latter purpose. A farther advance was made at the beginning of the 18th century in the introduction of clover and ryegrass, but like the sainfoin and lucern, their cultivation had embraced a limited area. A story is told of persons coming out of curiosity from remote parts of the country to see a field of red clover at the end of the first quarter of last century.

The home farm of Cardington is situated in the plains of Bedfordshire, and consists of an alluvial soil, bordering on the valley gravel and the Oxford clay. The land surface is only 100 feet above the level of the sea, and is about 60 miles inland from the coast. The different enclosures are mowed every two years and fed the third, the aftermath is regularly fed off, and they occasionally receive a dressing of muck. It is a common estimate, and it holds true here, that every three acres keep a cow summer and winter. We shall enumerate the plants of which the hay mainly consists:—

Anthoxanthum (Sweet vernal).
Lolium perenne (Ryegrass).
Agrostis stolonifera (Bent).
Poa.
Avena flavescens (Yellow oat grass).
Cynosurus cristatus (Cr. dogstail).
Alopecurus pratensis (Meadow foxtail).
Phleum pratense (Timothy).
Fescue ovina (Sheep's fescue).
Dactylis glomerata (Round cocksfoot).
Trifolea and *trifoil* (Red and white clover).
Arrhenatherum (False oat).
Holcus lanatus.
Hordeum murinum (Wall burnel).
Briza media (Quaking grass).
Triticum repens (Couch grass).
Ranunculus B. and *C.* (Crowfoot).
Plantago (Plantain).
Centaurea nigra (Knapweed).
Ononis arnensis (Rest. harrow).
Bromus's (Brome grass).
Carduus acaulis (Stemless thistles.
Bellis perennis (Daisy).

Excepting some varieties of the same genus, the above list includes the most, if not all, the seeds sent out by seedsmen as their select mixture for such a soil as Cardington; but it is scarcely necessary to explain that the half of those enumerated above are weeds, some of which may be good as condiments, but

few of them add to the value of the pasture as used either in grazing or in winterage, and could be dispensed with with advantage.

We are thus entering into these details, because the luxuriance and continuous summer verdure of the best grazing lands are notable, and where the accredited selection of grasses prevails, the fields have a closeness and thickness of sward, that might be attained on the mixed rotation soils of Scotland. The meadows of which we are speaking only take a secondary place in relation to soil and herbage, and they have been depastured with a cow stock which do not add to their wealth, and having been mowed twice every three years, has a still farther deteriorating result. Theorists have recommended the employment of the spud to clear such fields of the objectionable weeds, but the labour attending this operation, owing to their number and nature, would be endless, and the process could not be anything but incomplete. Where they have obtained large possession of the soil there seems no remedy, but paring and burning, and continued tillage till the last are gone. One remedial measure, acknowledged on all hands, is the feeding of the grass by dung or compost, which never fails to bring up finer and often stronger grasses, and which, by smothering and otherwise, discards much of the coarse herbage. Seedsmen, when directing about the laying of meadows, enjoin the picking out of the weeds when they appear. This looks more rational than the spudding of the old pastures, but even this could never be completely accomplished.

We have said that the half of the plants in these meadows are weeds, but it must not be inferred that the half of the herbage consumed by the stock are weeds, or the hay that is mowed twice in three years. Among the strongest plants, and those that contribute largely to the bulk of the hay crop, may be named soft brome grass, a variety that preponderates, crested dogstail, timothy, cocksfoot, the yellow oat grass, sheep's fescue, sweet vernal, red and white clover, and ryegrass. The ryegrass is not popular with some heavy land farmers; but its hardiness leads to the large use of it when laying down with seeds. In our observations we never failed to trace some of it in the permanent meadows of the south, but it is always a dwarfish plant compared with that grown under rotation, which is no doubt owing to the crowding in natural pastures. Sheep's fescue is not much of a food, and plantain is not worth the space it occupies. Mr Maclaren speaks more favourably of annual meadow than Mr Sinclair when testing its nutritive extract. It comes away pretty early to cover from drought, and recovers soon when the pastures are burnt up; so in favourable seasons it yields much succulent food through the spring, summer, and autumn.

The ranunculus (crowfoot), or rather the kind that is commonly called the buttercup, has a bad name; but in some parts of the country it is popular with the dairyman as a condiment, and as imparting a fine colour to butter.

It is worthy of remark, that though catstail grass was introduced into this country from America about a century ago, one, if not two, strains of it are natives of Clova. In that celebrated glen we have a proof of the value of a multitudinous variety of herbs in pastures. No sheep-walk among the Grampian Hills produces better fleecy flocks than are sold annually from these pastures. Of all the grasses catstail is our favourite, not for its bulk only, but also for its nutritious quality as well as its early growth. If cultivated on ground slightly moist, it yields a great weight of hay, and we believe the most productive strains of seed are grown in the West of Scotland.

In laying down arable land to permanent pasture, we have had a pretty successful example under our eye since 1873 on the estate of Westoning, the property of the Rev. J. G. C. Campion. It is a heavy soil with a clay sub-soil on the Oxford clay near the Gault, at an altitude ranging from 350 to 400 feet above the level of the sea, and is intersected by the main line of the Midland Railway, 40 miles north of London. The field was drained some ten years ago at a depth of 3 feet, and at 27 feet apart. In the autumn of 1871 the land was steam-ploughed in preparation for a root crop, and was subsequently ridged up, and manured from the farm-yard at the rate of eighteen to twenty small cart-loads to the acre. The ridges were split back, and in due course mangolds and swedes were sown. They were in two drills alternately, and turned out a fair average crop. The mangolds were drawn off and stored in November, and the swedes were left to be consumed on the ground by sheep, with which they had also a fair allowance of cake. They were fed off in December 1872, and the weather being favourable, the land was ploughed at once with a furrow about 4 inches deep. The reduction of this land to a fine tilth depends more on the action of the atmosphere than any cultural process; it was therefore deemed a matter of prime importance to have it early ploughed. Being dry enough to work without treading in the end of the following March, it was dragged with heavy harrows to pulverise it in preparation for barley, which was sown at the rate of two bushels an acre. The surface was then made very fine for the seeds, which were immediately committed to the ground, and a pair of light harrows, drawn by one horse, and rolling, completed the work. The following seeds were employed, being the mixture sent out by Mr Perry, seedsman, Banbury :—

Meadow foxtail,	2 lbs.	Evergreen meadow,	1½ lbs.
Rough cocksfoot,	6 „	Rough-stalked meadow,	3 „
Hard fescue,	2½ „	Trefoil,	1 „
Tall meadow fescue,	2½ „	Red clover,	1 „
Meadow fescue,	2½ „	Cow grass,	2½ „
Italian ryegrass,	7 „	White clover	5 „
Perennial ryegrass	10 „	Alsike,	1 „
Timothy or catstail,	2½ „		

These amount to 50 lbs. in all, and the cost per acre was 31s. We were over the farm along with the respected owner and Mr Robinson, his steward, in the beginning of August 1874, about six weeks after the hay was carried from the said field; it was then grazed by young stock. It had a pretty fair plant, not so close as could be wished, but its verdure contrasted favourably with the old grass fields on the estate. It will be remembered that 1874 was a dry and hot season; during the preceding three months of May, June, and July only 2·29 inches of rain fell in this locality, where the mean annual rainfall is 23 inches. Over the old grass fields of this farm, which extend to 500 acres, there was not one-third of the food on them that we saw in the preceding summer, and several fields in good seasons fatten an ox to the acre. Again, this year the said field was mowed for hay, and when we saw it in August the aftermath was strong, and the plants were much thicker. The red clover and the Italian ryegrass stood a foot high, the timothy and cocksfoot were not much less, and the fescues were pretty conspicuous; but there was still a patchiness about the field that made it look irregular. We should have said that it had a top-dressing of compost last January, and some renovating seeds. Lime was mixed with mould, that is, ditch scourings, four or five loads to one of lime, and from ten to twelve loads were applied to the acre. The hay was a poor crop last year, but this year the yield was little short of two tons an acre.

Those who have had experience in laying down land to seeds, express themselves well pleased with this Westoning experiment, and say that the field, which was worth L.2 an acre originally, will shortly be good value for L.3; but even that, on land that grows 50 bushels an acre of wheat when in tillage, is not very encouraging. We have seen fields that have been laid down by the inoculating process; but we suspect that, at the present price of labour, that plan would be a worse success. It simply consists in transplanting; part of ground under old turf is pared, carted, and cut into small pieces, and replaced with the green side up in the field which has been prepared for it. The pieces are placed in plots about one to the square foot, and pressed home with the foot; but they do not cover the half of the surface. Some seeds are also sown, and in the course of a year or two, the herbage of the turfy sods, with the aid of the seeds,

overspread the whole surface. One acre of rich old turf may be made in this way to inoculate 10 or 12 acres. The plan was popular at one time, and considered a certain method of producing a permanent pasture, and it is occasionally practised still. We have seen several farmers who have laid down some of their fields in that way, but they do not seem to be much in love with it. In the days of cheap wages, 50s. an acre covered the cost, but the mere labour does not include all, for there is the rent of the land, and the deterioration of the ground from which the turf is removed.

To ascribe, as most people do, the difficulty of obtaining a rich sward in newly laid down land, and keeping it in an improving state during the first few years, to climate only, cannot be accepted in the face of opposing facts. In many places England possesses pastures as good as are to be found anywhere. We have walked over the fattening grazings of Limerick, which rent from L.4 to L.6 an acre; and we don't think that the marshes on the Thames, or the wealthy pastures of Aylesbury Vale, are much behind Limerick with its moister and milder climate. Before we first visited the Vale of Aylesbury we had heard of the luxuriance and emerald beauty of its fields, and the sight of them even early in April, did not belie their repute.* The greatest number of oxen kept on these pastures are Herefords; but shorthorns as well as Devons are common. On the best farms there is generally a small portion of arable land, and also a limited area mowed for hay. The stock are purchased in the spring, and sold off fat after July down to the end of the grazing season; but a few are kept on till Christmas, and fed on hay and cake. The dairying pastures of the Aylesbury district are far more extensive than the fattening grounds, and consist of secondary and inferior land, which are mostly cold and heavy. On the richest lands dairy cows are prone to fatten, rather than to yield much milk. The finest grazings carry two heavy bullocks and two ewes with their lambs on every three acres; but the dairyman, as well as the feeder, keeps a limited stock in winter, and what he winters are kept on a limited stock of roots.

The analysis of the soil from the farm of Putlowes (one of the best grazing farms in the vale) is recorded in vol. xvi. of the Journal of the Royal Agricultural Society of England. Considering the luxuriance and fattening quality of the herbage, it will be instructive to quote that analysis, and for the sake of comparison, we insert in parallel lines the analysis of a boulder

* The story of the farm of Creslow is well known in the district, and being so notable, may be told again. A late occupier, at a time when war prices were obtained, sold twenty Christmas oxen at the average price of L.106, 6s., amounting in all to the great sum of L.2123. We believe that price has neither before nor since been exceeded for the same number of bullocks, fattened by one man and sold to the butcher.

clay soil in the same part of England. The latter has very much the character of the unmitigated Oxford clays; it was made on private account, and has never been published. Its tenacity is the chief impediment to the luxuriant growth of crops, and to laying down with seeds :—

	Aylesbury Soil.	Oxford Clay Soil.
Organic matter and combin. water,	16·10	6·10
Oxide of iron,	6·70	12·30
Alumina,	1·21	
Carbonate of lime,	9·26	17·96
Magnesia,	0·44	1·01
Potass,	1·15	0·85
Soda,	1·64	0·34
Phosphoric acid	0·58	trace
Sulphuric acid,	1·63	,,
Insoluble in acids,	57·11	61·43
	100·00	100·00

The insoluble Aylesbury soil is represented as under :—

Silica,	50·06
Alumina,	4·41
Lime,	0·57
Magnesia,	1·08
Potass,	0·99
	57·11

Both analyses were made by the chemists of the Royal English Society, but in the first column carbonic acid is shown along with the lime, whereas in the Journal it is entered at 3·29 and given separately. What are called clay soils owe their tenacity to alumina, which is a kind of Hercules among the earths, as sulphuric acid is among the acids. A very small per cent of alumina imparts its genuine characteristics to a soil—plasticity and cohesiveness. So far as we may infer from the analyses, there may be little more alumina in the sample of Oxford clay than there is in that of Aylesbury, notwithstanding the wide difference of their characters. Few of the clay soils, and even those styled strong clays, hold more than eight or ten per cent of alumina, but in ordinary circumstances it makes its dominant character conspicuous; and to the other constituents of the Aylesbury soil we must look for the explanation of the anomaly. Organic matter is well known to possess the property of loosening and imparting friability to clay soils, and there are good grounds for asserting that the large amount of organic matter in the Aylesbury soil is the means of making it what it is, so different in its physical properties from the other.*

* We have long thought the classification of soils has hitherto been defective If soils were grouped and named according to the preponderance of a particular constituent, then they would be necessarily reduced to one class only, namely,

We think the foregoing particulars throw some light on the subject of this paper. The analysis of the Aylesbury soil shows the value of organic matter in the production of herbaceous and gramineous plants, which suggests one way in which the soil may be treated to fit it more for their growth; whereas the other soil, which has now been seven or eight years down, looks poverty-stricken still. The lime, it should be observed, lies in an unavailable state, and other fertilising ingredients, it will be seen, are present in limited quantity; and though it holds a respectable quantity of organic matter, it is all too scanty to neutralise the obstinacy of the clay. About twelve years ago we carried out an experiment on a farm owned by us which we think illustrates this matter pretty well. The field had a light, friable, and thin soil, overlying trap rock; it had been in grass for two years, and it was situated in a district rather noted for leaky skies. In one field at a little distance we had a deep and large deposit of black undecomposed moss. This we digged away and mixed with hot lime, one cart load of lime to ten of moss. This was turned over twice, and allowed to lie for two years, for it was slow in decomposing. It was then applied as a top-dressing to the pasture field in the month of August, and laid on two inches deep. Some of our good neighbours began quietly to question our sanity, and pronounced that the last of our grassy turf had been seen. The weather was auspicious, and there came up the finest, and thickest mat of grass ever seen, which more than recouped us for the temporary deprivation of pasture. The park should have remained in pasture, but according to the then arrangement of the farm, it was ploughed for oats in January following, and fine crops of oats, roots, and oats with seeds followed in successive years. The seeds (consisting of 1½ bushels of perennial ryegrass, 4 lbs. of red and 2 lbs. of white clover) were mowed; that is, on the fourth year after the dressing, and though hay was a moderate price (about L.4 a ton if our recollection be right), it commanded L.15 an acre, having been sold by auction in the field ricks. In this we have another instance of how readily grasses respond to the enriching power of

sand; for silica, with a few outstanding exceptions, comprises three-fourths of the substances of all soils, and indeed three-fourths of the great globe itself. The great constituents of soils in popular and commonplace names, are sand, clay, iron-oxides, lime, and the remains of vegetable and animal matter in a decomposed state, or what is often called mould. Now it will be observed that writers on practical agriculture omit the iron, and here in the Aylesbury analysis, as in most others, it is present to the extent of 6·70 per cent. A more complete classification would therefore be according to their generic names, and which we place in the order of their abundance as follows:—1st, arenaceous; 2d, calcareous; 3d, ferruginous; 4th, argillaceous; and 5th, organic matter. The properties of ferruginous soils are little less marked than the distinguishing characters of the other leading soils, and its presence is readily recognised by the eye, as imparting a red or yellow colour to soils.

organic matter, four years after its application; but indeed all the crops were much above an average.

In laying down to grass, clays offer the greatest difficulty in securing a close turf. Even when well manured, cleaned, and pulverised, a good braird may not be got, and afterwards comes the trying time, two and three years after the seeds were sown. The herbage, especially on secondary and inferior soils, becomes poor, weak, and mossy, and the soil itself has the appearance of losing condition. Improving farmers who wish to acquire a maximum of produce find themselves shut up to the use of enrichments to stimulate and thicken the plants, and the only possible way is to feed the grass on the top, as in our own experiment, and that of Westoning already described. Court-yard dung, lime, bones, guano, nitrate of soda, and ammoniacal manures, are the main applications in use. The plan of supplementing the grass keep by cake has become pretty common, and farmers are thereby enabled to reduce the bill for artificial manures considerably. We have long thought that it would be an advantage to stir the soil of the old grass land, and the stiff soils of these recently laid down by a sub-turf plough. We think the hard and consolidated soil might be loosened and pulverised without material interference with the surface sward. No doubt the soil would revert in a short time to its old compressed condition; but the process would doubtless induce chemical action, and great facilities would be afforded for the ramification of the roots of the plants. There would by this act of husbandry be adequate provision for the circulation of air and water, perhaps any excess of space would in a short time cure itself, and the stages of change would induce that right medium, which has been styled the greatest density of soil pervious to the roots, that brings the largest quantity of food near the plant.

Much as is the value of the manure of sheep, and the benefit it would confer on the land, depasturing with sheep on recently laid down land is universally rejected. This is done on the plea that sheep eat out the centre of the best grasses, thus leaving rough grasses and making space for them to send up their seed stems, which deteriorates the pasture very much. On a light grassy soil our experience of sheep was rather favourable; for though they may have gnawed out the sweetest grasses, there came up a very close sward in the course of one year, which proved the finest pasture we ever had. We cannot help thinking that the common practice of mowing the fields in the first two years is a blunder. There is often a good deal of underlying truth in the sayings of our ancestors, and there are two of them that occur to our memory. The one is that the scythe is the greatest robber which comes on the farm; and the other is almost identical, namely, that ploughing is better than unlimited

mowing. Our experience fully corroborates these views, for we found ryegrass, of which the hay mostly consisted, a very exhausting crop, and, unless in special circumstances, we hayed very little for a quarter of a century, and that only to be utilised as seed, and for the farm horses in spring. The decadence of the pasture by mowing may be as much owing to the weakening of the plant as the carrying off of the crop from the land. Of course the ground may be recruited by one or other of the accredited grass manures; but unless by going to a great expense, we always thought that the feeding of the ground by sheep or cattle had a greater restorative power than a considerable dressing on light land.

Opinions are still considerably divided, as to whether seeds should be laid down with or without a crop. Those who advocate and practice the sowing down without a crop, argue that should there be a deficient plant, the crop is left to flower, and stand till the seeds ripen and drop, and thus by replenishing the ground, a closer bottom is secured for succeeding years. If not requiring this renovating process, the seeds are ready for grazing by June, and should weeds threaten to impair the cultivated plants, they can be mowed timely to prevent them seeding. It is also true that without a crop stronger and deeper rooted plants are secured; which, in case of a severe winter following, run less risk of being killed. But in the face of these facts most farmers prefer the first advantage, which though it may not be ultimately the most profitable, yields the more immediate benefit.

We intended to have given some particulars of the management of pasture lands in the famous county of Northampton, as so correctly carried out by Mr George King of East Haddon, as well as the system followed on the manor farms at Berkswell in Warwickshire, where a kind of convertible husbandry is practised by Mr M'Nicoll, the steward; but, as this paper is already so lengthy, we must refrain.

The wealth of the world, it is said, lies in the weather; and, as heat and moisture are the chief elemental influences that control husbandry in all its departments, we subjoin a table of the temperature and rainfall of Cardington, which we lately drew up for publication in an agricultural newspaper, and which may be accepted as a fair sample of the South Midland Counties of England. By way of comparison we also tabulate the records of the Braemar Observatory. The readings are for the year 1873, and the rainfall, and the highest, lowest, and mean temperatures are recorded for each month. It is noteworthy, that though the site of the Braemar Observatory stands 1114 feet above the level of the sea, the rainfall is not at all what would be expected. In fact, the valley of Strathmore has about the same amount of precipitation, for the mean annual

fall of the last seventeen years at Braemar is within a fraction of 35 inches; but, if the dripping year of 1872 (which brought down 59¼ inches) be deducted, the annual fall is 33 inches only. Again, the annual mean temperature at the respective stations is 43·9 degrees, and 48·5 degrees.

BRAEMAR.

	Air Temperature.			Rain. Inch.	Days rain fell.
	Highest.	Lowest.	Mean.		
January, . . .	57·0	18·0	36·3	4·48	23
February, . . .	47·8	8·0	33·2	0·87	6
March, . . .	55·0	20·0	36·5	0·69	7
April, . . .	61·8	26·3	46·2	1·74	15
May, ...	66·2	27·2	44·0	6·18	18
June, ...	68·8	29·0	53·5	1·83	15
July, ...	79·5	35·8	55·4	4·21	23
August, . . .	66·1	30·0	53·6	2·64	21
September, . . .	68·3	35·0	48·4	6·67	22
October, . . .	59·2	23·0	41·4	3·89	20
November, . . .	51·8	19·0	37·4	4·82	18
December, . . .	60·8	20·1	41·1	3·16	18

CARDINGTON.

	Air Temperature.			Rain. Inch.	Days rain fell.
	Highest.	Lowest.	Mean.		
January, . . .	54·0	25·0	41·1	2·06	16
February, . . .	52·0	23·0	34·8	1·40	11
March, . . .	63·0	27·0	41·0	1·34	17
April, . . .	74·4	28·0	45·8	1·06	9
May, ...	69·0	29·0	50·6	1·83	14
June, ...	82·0	41·0	59·6	2·24	10
July, ...	88·4	43·0	63·8	1·89	10
August, . . .	83·4	45·4	62·0	2·15	16
September, . . .	70·0	32·4	53·5	1·82	12
October, . . .	56·4	38·9	47·4	2·06	10
November, . . .	57·0	22·6	43·1	1·90	13
December, . . .	57·6	20·0	49·0	0·45	7

As the current year, 1875, has been exceptionally wet, we annex the rainfall at Cardington for the first ten months:—January, 2·27 inches; February, 1·30; March, 0·43; April, 1·67; May, 1·33; June, 2·95; July, 5·20; August, 1·32; September, 2·23; and October, 4·47—in all, 22·17 inches.

While there are some details of English pastoral management worthy of imitation, it is not less true that several lessons may be acquired in North Britain well adapted for England. The countries differ much in climate and soils; and, indeed, the diversities in different parts of each of them control very much

pastoral and tillage management. The English farmer has several advantages over the Scotch. He can, for example, grow forage crops for green food more successfully, and is thereby better enabled to meet the requirements of modern farming. Rye, which makes capital green food, may be grown as a stubble, or stolen crop, without interfering with any other crop. The land may be seeded for 12s. or 16s. an acre; and we have seen it as forward at the beginning of March as some other green crops are near the end of April. For ordinary farm live stock, turnips may be sufficiently abundant in the spring months; but nothing can be more suitable for young lambs, (a stock that demands the breeder's greatest care) than the fine early grass in the counties where water meadows prevail. Other green crops are also cultivated for spring and summer soiling; and at a recent date Enfield market cabbages have been tried, and found to make capital summer keep, very useful in supplementing the grazings when diminished by the drought of summer. We have seen the pastures burnt up in a hot summer to a degree which we believe is not often witnessed in the north. Plants can no more live without water than an animal without food, and a good crop is only got when a certain amount of rain falls now and again. A dry hot summer brings the largest yield of the staple crop of England; but the pastures suffer much, as may be inferred in looking at the temperature, and scanty rains of the early summer, hence the necessity of providing other food in addition to the grazings, to meet such summers as 1868, 1870, and 1874.

As to the difficulty of clothing an arable field with seeds, England is not alone; for we are told that there are some descriptions of soil in Scotland that do not take so readily to grass, nor retain it so well as could be wished, and that nothing is more common than to see pastures in a thin and sickly state after the second and third year, especially on light and secondary land. Like the stronger soils of the south, after lying a year or two they become firm, consolidated, and show a diminished bulk, as is well evinced when again broken up by the plough; but we think that kind of compression differs from the tenacity of English clays, and does not offer the same obstruction to the root-fibres of plants. This decadence is probably due to the poverty of the land, and we understand that on "eating" grounds, as they are called, great dressings of lime and earth do not suffice to arrest this downward, and apparently natural progress of things, and to raise the ground from sterility to comparative fruitfulness.

Good as are some of the pastures, not excepting some of the soils that have a mixture of stubborn clays, we think, and in this we do not claim exemption from error, that could the

Oxford and other strong clays be wrought upon the alternate system of grass and corn, they would yield more profitable returns both to the occupier, and owner; but some scheme is yet wanted to modify and change their natural character. The mixture of seeds used in laying down arable land are a selection of the best indigenous and native grasses, and their number and variety, when they are fairly thickened, impart a beautiful verdure to the pastures throughout the grazing months that is very serviceable. The different sorts possess a natural growth at different periods as summer advances; and it is a question worthy of the consideration of the farmers north of the Tweed, whether they might not introduce a greater number and variety of seeds than they usually do when putting their fields down to pasture.

ON THE CULTIVATION OF THE POTATO.

By Mrs Paterson, now Roger, Potato Merchant, 38 Union Street, Dundee.

[*Premium—Five Sovereigns.*]

What method of cultivation ought to be adopted in order successfully to prevent a total failure of the potato crop, and to produce a vigorous habit and constitution to resist the attacks of disease to which the old varieties have been so long subjected, is a question of vital importance to our country and to the world, the potato being a necessary auxiliary of food, and consequently the cultivation of it a great commercial enterprise. This question, for many years past, has attracted the earnest attention of the statesman, the philosopher, the economist, and the man of science, and now that disease again threatens this palladium against famine (when this phrase was first used, I question much if it was thought the object of the eulogy should itself be the cause of famine and consternation), it must be obvious that great necessity exists in agriculturists devoting their utmost thought, care, and attention to the culture of new varieties of potato.

Potato disease is the result of degeneration and decay, caused by repeated propagation from the old varieties. As a natural consequence the plant must, and will wear out. It becomes weak in constitution, worthless as a cropper, and subject to many forms of disease from the vicissitudes of climate or atmospheric action, not only after it has developed its stems, but before the germ has risen out of the ground.

From the experience I have had of potato raising and potato culture, my conviction is there is no remedial cure for the disease, it being inherent in the plant, caused partly by atmospheric action, the plant having the seeds of disease within itself ready to be developed under favourable circumstances, and that the present stock will be more or less subject to it.

The potato is only destined to serve its day and generation the same as animal life, and a successive and regular renewal of the esculent from the small seed found in the plum of the potato, thus producing an infusion of new blood, is no doubt the only effectual remedy for disease, restoring *vigour* and saving the plant from annihilation. It was only about the year 1826 that disease in the potato seems first to have attracted the attention of agriculturists. As to the cause many conjectures were put forth, and all experiments tried that human skill could devise to ward off the epidemic and regenerate the old plant to its original strength, but in vain. Previous to the visitation of the fatal blight of 1846, which in one night nearly destroyed the whole crop of the nation, the potato had become so weakened in constitution from repeated planting, that the plant had almost ceased to flower, and the potato plum so entirely disappeared that I question much if the rising generation were aware that ever the plum existed, or that new varieties could be grown from them. Each plum has its small seeds innumerable, every one of which produces potatoes of varied form, colour, habit, and constitution, and wonderful to relate, perhaps none of them the same as the mother plant, and great difficulty is experienced in getting one good seedling out of the many varieties.

In the year 1853 the potato in this country had ceased to flower or bear plums, which necessitated an amalgamation of varieties blended together by atmospheric action and insect labour, in order to produce plums.

Potatoes (*Solanum tuberosum*) from Central America, Chili, East and West Indies, Australia, and Cape of Good Hope, were imported into Scotland and planted *promiscuously* with the "Rock" potato (brought into Scotland from Ireland in 1848), in a field of newly taken in land where the atmosphere was damp, and the field previously manured in the autumn with farm-yard dung. Most of these plants produced flowers, but only a few bore plums, and still fewer plums ripened. However, the experiment was successful; *new seed* was obtained, and from these insignificant looking things have been produced the countless new varieties that have restored the potato to the comparatively healthy state it is now in from the dead rot of 1845, which threatened to exterminate it from off the face of the earth.

I shall now explain how new kinds may be raised from the small seed of the plum or apple of the potato, to replace the old and worn-out varieties.

Gather potato apples when ripe; those that fall off the shaws of their own accord are the ripest and make the best seed. Store them in a water-tight vessel, and allow them to remain there till the glutinous matter becomes decomposed, then bruise them down amongst water, filter through a sieve so as to pass the seed

through, leaving the refuse back. Again mix the seed with plenty of clean water, pass it into a sieve small enough in the meshes to retain the seed, keep working the sieve well in the water till you are certain the seed is entirely free from the pulp, then dry thoroughly on a thin cloth in the sun, or indoors in a dry situation. It will then be fit for use. Sow in March month in a box filled with properly prepared mould, covering the seed about half-an-inch with the earth. The box may then be placed in a greenhouse of moderate temperature, care being taken to keep the earth in equal heat and moisture.

When the plants are a few inches above the ground, which should be in about a month, pick out the most robust with plenty of earth attached, and transplant them to an early border, which should slope to the south, manured, say with one-fourth lime, one-fourth wood-ash, and one-half decayed leaf-mould, all mixed together and scattered over the surface of the border. The lime will prevent destruction by worms, woodash (the food of the plant), will improve the skin and growth of the potato, and the leaf mould will serve as a nutriment. The sets should be planted twelve inches apart so as not to obstruct each other. Water a little when requisite. Hand weed. Draw the earth carefully from time to time round the necks of the plants, taking care not to chop, cut, or injure the stems, and continue their culture the same as other potatoes. You will know when they are ready for lifting by the leaves turning yellow and the decay of the shaws; they may then be forked up and stored. Those that ripen by the middle of June should be put away marked as earlies, and those about July as second earlies, and the late ones as standard kinds.

It will be years of continuous cultivation before you get quantity, or even some proof as to quality, of any single variety, but just go on, carefully keeping every kind separate. Discard all weak plants, and only grow those that appear to be *compact* in growth, well formed in the tuber and vigorous in habit. Carefully store the produce of each plant in a box by itself.

In March replant, during a moist day, each variety in a drill by itself in an open field of easy soil, and in a well sheltered situation having a southern aspect, properly ploughed and manured the previous autumn with about twenty tons of farmyard manure to the acre. Open furrows three feet apart, and plant sixteen inches from set to set. Plant carefully, not to injure the sprouts, placing the sets with the eyes uppermost. Potatoes that have not sprouted but merely pushed out buds are the best, but if the sprouts are long they should be removed, as it would be difficult, unless in garden planting, to keep them entire. The setters, who should move in a retrograde position, should be provided with baskets from which to drop the sets into the drills. Make it a strict rule to cover up each drill as soon as

planted, in the manner in which they were before opened, and at *no time lay down more sets* than can be covered up immediately; for if left exposed to frost they will be useless, or if left to the action of the sun and then covered up with the hot earth some of their vitality may be destroyed, and you will not get a regular braird. If a top-dressing of wood-ash or charred vegetable mould is thrown over the drills before the last furrowing up, it will be serviceable as extra manure. Two hundredweight of guano to the acre makes a good azote. On stiff and retentive soils, decayed tan, if freely used, has been proved to be highly beneficial in warding off blight. When the haulm appears above the ground, which if the weather is favourable will be in about a month, the hand hoe or scraper should be passed between the drills so as to destroy all weeds, which are very injurious to the growth of the potato. By the time the plants are meeting in the drills they should have had their last furrowing up.

"If the blossoms of the potato plant are picked off before they run into plums (which could be done by boys), it will increase the weight of the tubers considerably, as much strength of the plant goes to nourish the plums." When potatoes are ripe the sooner they are lifted the better, dry weather being chosen for the operation. All should be lifted and stored by the end of October, or before the frost can injure them. There are various ways of taking them out of the ground, the hand grape, the plough, single and double, and also machinery, but whatever method is used, the principal object should be, to *lift them all*, and to *gather up all* as *you proceed*, for if once trod into the soft earth no harrow will take them out. The intrinsic value of the potato consists in its being neither too large nor too small, rough skinned, white fleshed, fine flavoured, mealy, and the eyes few and shallow.

After the trouble of raising and cultivating such a precarious and valuable crop as the potato, great care should be taken in the storing. The best method to keep them is in clamps or pits, either round or prismatical in form, and should slope evenly from the roof to allow the rain to run off easily. The pit should be laid with the ends north and south to keep off as much as possible the frosty winds of winter. The bottom should be four or five inches below the level of the ground and three feet six inches wide. The height of the pit from three to four feet. The lighter and thinner potatoes are pitted the better. No matter how long the pit is, supposing there is room and plenty of wheat straw to cover it. The most important thing to guard against is heat, and that especially in new seedlings, as they are young and vigorous and full of moisture when taken out of the ground. Place plenty of clean dry straw on your potatoes, say about a foot thick from top to bottom. Then cover very lightly with

earth, just sufficient to keep the straw down. On no account, if you value your potatoes, cover completely with earth till they have had time to cool. In about a month or six weeks, if there is danger from frost, place sufficient earth on the pit to secure the potatoes for the winter. If plenty of straw is used it will be sufficient to keep out any frost till the potatoes have had time to throw off their moisture which they will readily do. All the shaws should be gathered off the field in a heap. I have often kept a pit all the winter, especially the Bovinia potato. with but a light covering of earth loosely thrown on, and the old potato shaws thrown thickly over the top. Frost and snow never hurt them, and they came out in March, cool, hard, and sound, and what is of great importance, had a splendid flavour always essential to a good table potato. One reason why we often get potatoes of doubtful quality is through careless storing, and not the fault of the ground they are grown in or the seed planted.

Further, to protect the plant, potatoes for seed purposes should be grown especially for that end and not for an abundance of crop, and in a different district altogether from where they are required for planting for ware purposes. Put them as far north as possible, to make them hardy, and if possible on newly taken in land of a light loamy nature or a clean sandy soil by the seaside.

The seed should be planted in March, the sets 12 inches apart and $2\frac{1}{2}$ feet between the drills. This will give a uniform size, and nearly all of them will be fit to plant whole, and will contain more soluble than starchy matter. In many cases such seed when planted in good soil will yield several tons more per acre than what is called "middlings," such being the after growth of the plant and unfit for seed purposes. Depend upon it, it is folly and mistaken economy to use such seed. They will not produce uniform crops, and they are not sure to produce even an average one, and the tubers not up to size. When disease appears it is first seen in such crops—and no wonder; for the seed perhaps is grown for years in the immediate neighbourhood, or the small potatoes, the refuse of those sold in our markets for domestic purposes, dressed over a $1\frac{1}{4}$ in. riddle for seed; such potatoes are too weak in constitution to bear a crop, let alone resist disease. In fact if you wish for crops of good quality, regular in the braird, strong in growth, and with abundance of tubers, you must select your seed grown for that purpose.

Potatoes grown in the manner I have described for seed, do not approach in quality or shape those grown for table use, the exposed situation they are grown in not admitting of either; but when removed to a more genial climate, they are often so much altered for the better that you would scarcely believe they were the same kind. In all cases care should be taken to select

seed suited to the soil you intend to plant in. Rocks, regents, and kidney potatoes put out long filaments and throw their tubers wide of the shaw, so that it is injurious to plant these varieties in a strong soil, which naturally hinders their growth, when a light sandy soil would encourage that particularity and give them free scope. Other kinds, the Victoria for instance, press the tubers so closely together that the soil in this respect is not of so much consequence; yet strong soils, as a rule, do not give potatoes of fine quality or the best adapted for table use.

Material good has been produced in keeping away disease, by transferring seed from one locality to another. Remove from an unproductive to a more generative soil, and from a cold to a more genial climate, if you wish to propagate largely. If whole sets are available they are the surest and best for planting. They should weigh 2 or 3 ounces each. If cut seed is used the number of sets must depend on the size of the tuber and the number of eyes they possess. Kidneys and flukes are best planted whole, as they have few eyes and only at the rose end. Victoria may be cut into two sets straight down the centre. Regents, rocks, early round, and bovinia in angles, ranging in size and number according to the eyes of each tuber. When seed potatoes are fresh and in good order, they cut crisp and exude a good deal of moisture, which soon evaporates. The ground should be ready to receive them when cut, and it is not good to heap them up in a cart, shed, or barn when cut. I believe most positive injury is done to the crop by such treatment, as fermentation will set in and destroy life. The surest and best method is to cut and plant immediately. It will take 12 or 15 cwt. of potatoes to plant an acre.

In regard to varieties, they are at present so numerous that a list is of little use, as the application would depend on the soil and climate. There is no difficulty in selecting for field or garden planting, potatoes which have at least undergone a partial test, conducted with great care, and reported upon from time to time by professional and amateur growers. This enables others to select seed best suited to different localities. No absolute rule can be laid down as to when particular kinds may be planted, but they may be classed in three divisions. Plant early kidneys in February, second earlies in March, and late varieties on to May. Bovinia, being of quick growth, may be planted as late as June.

Although I have compiled these remarks from my own experience, and not gathered them from books, I do not presume to uphold them as a complete guide to agriculturists, but rather in the hope that they will add one link to agricultural knowledge and domestic economy.

Before concluding, I would ask agriculturists of experience

what the consequence would be if blight in the potato plant again swept the land as in 1845–46 ?

Though the new seedlings that have been raised have not been exempt from disease, there is no evidence to show that the apples gathered for the purpose of raising the new stock were the product of sound plants. Quite the opposite. If the argument holds good that the seeds of disease are in the plant ready to be developed, Are the plums free from disease ? I say no ; but if the process of cultivating new kinds is carried out, it must, and will, result in the production of fresh and strong stock.

I suppose that every person is aware that light soils produce better-flavoured potatoes than those grown on clayey soils ; for the soil has an influence whatever may be the variety, and those grown on land previously manured in the autumn are finer flavoured than those planted in immediate contact with the dung in the drills.

Manuring in the autumn is one of the best methods to adopt, with a top-dressing of wood ash, or ashes from pairing and burning ; they supply a valuable potash, the food of the plant.

The Americans burn quantities of timber for black ash and potash, and which forms a very valuable article of commerce. Seaweed is also freely used where it can be had.

As potato possesses a spreading root, it requires a uniform manuring, not an instantaneous supply of soluble matter. The esculent being produced and perfected during the latter period of the growth of the plant, it wants the greatest amount of nourishment at that time for the development of the tubers.

What invigorating substance, and in what quantity it should be used, is a most difficult question to answer, particularly as manure in all cases acts more quickly on plants when it is well prepared.

In an economical point of view the safest and best manure for potato is that which contains plenty of azote, and does not decompose too quickly. The following will be found to be a good mixture for potato manure :—4 cwt. of mineral superphosphate, 2 cwt. of muriate of potash, and 2 cwt. of sulphate of ammonia per statute acre. This is suitable for light soils. In the case of heavy soils, 2 cwt. of nitrate of soda takes the place of the same quantity of sulphate of ammonia. These manures are mixed with twice their weight of finely-screened earth, and sown broadcast before planting the potatoes. The above will give fully as good returns as 20 tons of farm-yard manure.

Had farm-yard manure been other than a compound containing all the ingredients of the produce raised on the farm, many more potato failures might have occurred. These ingredients

undergo various chemical changes while circulating, and are prepared and fitted for entering when and where it is necessary into the solid and fixed parts of the potato plant, and each exercise a chemical action on the elementary bodies, which they meet with in the stems and wood of the plant. Ammonia and ammoniacal salts, as a rule, produce bulk; and phosphate also produces quantity and bulk. The aim should be to secure both.

If agriculturists wish to cultivate their soils successfully, they must spend a deal of money on manures, as the present state of cultivation necessitates the application to the soil of more fertilising agents than is obtained from farm-yard manure. Potash is an indispensable article for invigorating the health of leguminous plants, and where alkali is abstracted it must be applied with no sparing hand.

However easy it may appear to apply artificial manures to the soil, as long as the knowledge of chemistry is so limited in the respect of application, manures must continue to be applied much in the same manner as at present, with such gradual improvements as inquiry and progressive chemical knowledge may direct. Has the agriculturist nothing to answer for? Does he restore to the ground, by manure, those properties which former crops have taken away, and which are necessary for the healthy cultivation of potato?

Last century Sir H. Davy called the attention of agriculturists to the fact that the land became exhausted from repeated cropping, and that something ought to be done in partial appliance of chemicals. About 30 years ago Professor Liebig directed attention to artificial manures with a view of replacing the azote that had been extracted from the land. I do not mean to infer that the improper use of artificial manures has been the cause of potato disease, but this I know, that land never before cultivated is most productive of potatoes free of disease.

ON THE AYRSHIRE BREED OF CATTLE.

By Thomas Farrall, Aspatria, Carlisle.

[*Premium—Ten Sovereigns.*]

Introductory—Geography of Ayrshire.

Seeing that the climate, surface, soil, and geological formation have always a remarkable effect on the cattle bred and reared in any district, it has been deemed desirable to give a short geographical sketch of the county of Ayrshire, the home of the Ayrshire breed of cattle.

The county lies in the south-west part of Scotland, and forms

a sort of natural basin. Owing to its close proximity to the sea, the climate is somewhat moist, but far from unhealthy. The rainfall is considerable, especially near the Isle of Arran, where the clouds, being attracted by the lofty mountains, oftentimes drop their moisture pretty copiously. The air is mild, not being subject to such extremes as in the east of Scotland; nevertheless, bitter storms from the Atlantic are sometimes experienced. Rivers are numerous, their general direction being from east to west, but few of them exceed thirty miles in length, many of them much less. The principal are—the Ayr, the Doon, the Girvan, and the Stinchar. The geological features of the county may be thus briefly defined:—Northward, from the river Girvan, the Old Red Sandstone occurs frequently; and on the south, the Lower Silurian strata chiefly prevail. The upper or superficial soil is varied, consisting of clay soil, light or sand soil, and about 300,000 acres of moss or moorland. The light or sandy soil skirts the entire length of the coast, being interspersed with a deep and fertile loam. The moorlands lie principally along the eastern boundary, and are intersected with large mosses, the principal of which are Aird's Moss, and Moss-Mallock. The latter lies partly in Lanark and Renfrew shires. In the parishes of Muirkirk and New Cumnock, which are in the eastern part of the shire, more than half the land is moss. By far the largest extent of the surface soil, however, is of a clay character, which varies much in its quality; in some parts it is strong and productive, while in others it is wet and cold, producing a poor class of herbage, barely sufficient to keep alive a breeding-stock, and totally unfit for fattening cattle. Notwithstanding this, the county of Ayrshire occupies the second position in Scotland as regards stock-breeding, being surpassed only by Aberdeen.

It may further be remarked that Ayrshire is naturally divided into three separate districts, viz., Cunningham, which embraces the whole of the surface from the river Irvine northwards to the confines of the county; Kyle, the central division, extending from Irvine southwards to the Doon; and Carrick, which takes in the whole extent south of the Doon. Cunningham is the district whence the improved breed of Ayrshire dairy cattle have sprung into existence.

About three-sevenths of the entire area of Ayrshire is in cultivation. Oats form the principal crop. A little wheat is raised; and large quantities of potatoes are grown on the light soils along the coast. Turnips and clover are also produced in abundance. Nearly one-half of the cultivated land is devoted to pasture, rather over one-fourth to clover, upwards of one-sixth to oats, and the remainder to miscellaneous crops.

History of the Breed.

Various theories have from time to time been promulgated anent the origin of the Ayrshire breed of cattle. That it was at the outset, in common with other breeds, descended from the wild cattle, which in bygone days were to be found roaming at large throughout Britain, admits not of a doubt; for it is well known that the various circumstances of climate, soil, and so on, have a wonderful tendency to change the form and appearance of any species, whether of cattle, sheep, horses, or other animals.

In wild animals, a uniform figure and colour are generally found to prevail, that is, when they have unrestricted freedom; but confine them to any particular district, and they begin to assume certain characteristics quite peculiar to themselves, not indeed to individual animals, but to those under the same condition of life—characteristics conformable to the district where they are confined. The longer this sequestration continues, the more marked and better defined will be the features of which it is the principal cause, until, in the end, they become inseparable from the breed by which they are possessed. On this point a reasonable question might be put—"Why this sequestration or retirement?" It may be answered in the following manner. Undomesticated animals often, quite of their own accord, attach themselves to certain localities, which they and their offspring cling to for successive generations with pertinacious tenacity. Herdwick sheep, for example, originally chose for their heath the mountains of Cumberland and Westmoreland, after having saved themselves from a stranded ship on the shores of the Solway Firth, and have at length attained those characterisms which fit them well for the position they have to occupy.

It therefore seems most probable that a few descendants of the ancient British breed originally settled down in the western part of Scotland; where in time their progeny acquired properties quite in accordance with storm and tempest, upland moor and barren moss. Many of the peculiarities they then possessed undoubtedly betokened wonderful milking capacities, in the same way that several points of the unimproved shorthorn indicated a tendency to early maturity, or that the form and general appearance of the West Highlander denoted extreme hardihood.

In the manner just described, it is believed that nature laid the foundation of the most noted milking breed of the present day. The wily Scots-farmer would probably soon find out the existence of this important quality, and perhaps strive to improve it so far as his knowledge extended, or his means per-

mitted; but, in absence of authentic records bearing on the point, it is impossible to show by what progressive steps the Ayrshire cow was moulded into the form it possessed at the middle of last century; yet it is reasonable to imagine that very little had been done in the way of selection or crossing with superior animals of the same type up to that time; for Aiton, who wrote in 1825, describes the cattle, from his own recollection, as having been a puny and unshapely race. The cows then gave only 6 to 8 quarts of milk per day, and seldom exceeded 20 stones when made fat, even in the height of the season.

So much for the supposed origin of the breed. The records bearing on the improvement are much more reliable. Still, the statements of writers are not unmixed with tradition, but so many facts have been preserved from the pens of those who can be trusted, that it is not a difficult matter to find connecting links in the history of the Ayrshire, from the middle of last century until the present time.

The first mention of the Ayrshire breed of cattle is supposed to be made by Ortelius, who wrote in 1573, when he says that "in Carrick are oxen of large size, whose flesh is tender, and sweet, and juicy." Compared with other native breeds, as the North Highlander, the Ayrshire might then, as indeed it is now, be comparatively large. For about 200 years after Ortelius wrote, little mention is made of the Ayrshire, from which it may be inferred that the breed was not held in any wonderful degree of esteem; in fact, Culley, who wrote his treatise on live stock towards the close of the 18th century, does not even mention the Ayrshire as one of the recognised breeds of the country; and Fullarton, in describing the county in which it was found, speaks of it in a manner so general as to show that it was not regarded as anything remarkable.

Little progress, however, could be expected in the breeding and rearing of cattle, when the agricultural condition of the country is considered. The almost total neglect of land culture has been ascribed to the religious feuds and dissensions which the inhabitants of this part of Scotland passed through for a protracted period previous to the year 1780, bringing upon them the usual concomitants of poverty, misery, and squalor. Colonel Fullarton, in his survey of Ayrshire, says that there were few good roads in the county; that the farm-houses were miserable and dilapidated; that the land was foul with weeds, and that there were no fallows, no green crops, no sown grasses, no carts nor waggons, and no straw-yards. Milk and oatmeal, with a few greens, formed the chief diet of the people, and the land was scourged with successive crops of oats. Cattle were herded or tethered on the bare pastures in summer, and in winter, so poor and meagre was their fare, that they were scarcely able to rise in

spring without assistance. Very little agricultural improvement was effected until the close of the American War; and much of what has been done is due to the pioneers of the present century.

So recently as 1811, in a report upon Ayrshire, the cattle were described as being almost wholly black. That there was a certain uniformity of colour may be gathered from the fact that provincial terms were invented, having reference to the location of certain colours. Thus, a cow marked with white towards the extremity of her tail was said to be "tagged"; if a strip of white ran along the ridge of her back, she was "rigged"; one with white on her neck was a "hawked" cow; a dark one with a white face, a "bassened" cow; one with a profusion of white spots upon her body, a "spotted" cow; and one with large patches of white, a "bawly," being a corruption of the term "piebald." The cattle in Cunningham were described as being small in stature and badly fed; they were principally black, gaily dotted with white spots; their horns were crooked and irregular, and marked with ringlets near their base—a true criterion that their "lines were not cast in pleasant places."

The improvement in the Ayrshire breed of cattle dates from the year 1750, when, it is stated on competent authority, that the Earl of Marchmont had brought from his estates in Berwickshire a bull and several cows, which he had some time previously procured from the Bishop of Durham, of the Teeswater breed, then known by the name of the Dutch or Holstein breed. These cattle were of a light brown colour, spotted with white. They were introduced into the district of Kyle by Bruce Campbell, his lordship's factor, and rapidly getting into repute, their progeny gradually spread into the adjoining districts. A bull from this stock was eventually purchased, at what was considered a very long price in those days, by a Mr John Hamilton, who raised a numerous herd by crossing with the native cattle. Tradition asserts that other proprietors brought to their farms foreign cows of the same breed, and assuming this to be correct, it may readily be conceived that the dispersion of the progeny would exercise a wonderful influence in improving the native breeds. About the same time that these cattle were introduced, Mr John Dunlop, of Dunlop House, in the Cunningham district, purchased several stranger animals, from which the Cunningham cattle of the present day are descended. The first crosses were obtained by coupling bulls of the stranger with cows of the native race, but the offspring had an ill-shaped, mongrel appearance, their bones being large and prominent; yet in time these became toned down so much, that by continued care in breeding, they at length possess all those well-defined features considered so desirable in dairy cattle.

In 1769, John Orr of Barrowsfield bought in some stranger cattle, and his example is said to have been copied by several

other dairy farmers, but no mention of their names is made. As to whether some of the cattle which were introduced into Dunlop were Alderneys, as tradition asserts, there are no positive means of determining, but the great similarity which exists between the Alderney and modern Ayrshire would naturally lead to the conclusion that the blood of the one has been largely mixed with that of the other. There is the same peculiar character of the horns and colour of the skin; in fact, the general resemblance is so great, that both Jersey and Alderney cattle are occasionally mistaken for Ayrshires. A lecturer at an English farmer's club meeting quite recently stated—on what authority he did not mention—that "several Ayrshire farmers had introduced cows from the Channel Islands, from all which, combined with West Highland blood, the present improved breed of Ayrshires had arisen." An unknown writer in the "Complete Grazier," the third edition of which was printed in 1808, says that the Dunlop breed is the result of a cross between Alderney cows and Ayrshire bulls. The horns of this race are small and awkwardly set. The animals, it is further stated, are small in size, and of a pied or sandy red colour. They are, notwithstanding, admirably calculated for the dairy, on account of the richness and quality of their milk. Some people aver that this is another account of the Dunlop importation, where the Alderneys are accredited with the improvement, rather than the Dutch, Teeswater, or Lincolns.

There is great uncertainty, and consequently much diversity of opinion as to the early history of these crosses, but weighing matters carefully over, and judging from the character which the descendants still possess, it seems possible, nay, indeed, probable, that the blood of both the Teeswater and Alderney types has been largely mixed with that of the native stock. In support of the statement regarding the introduction of Alderneys, it is asserted by Colonel de Conteur, that Field-Marshal Conway, the Governor of Jersey, and Lieut.-General Andrew Gordon, who succeeded him, both sent about the close of the eighteenth century some of the best cattle to England and Scotland. And Quayle, who wrote an agricultural survey of Jersey, says that the Ayrshire is a cross between the shorthorn and the Alderney. No doubt when he wrote the word "shorthorn," he intended to convey a general meaning, pertaining to shorthorn cattle as distinguished from longhorns, and not to the tribe now known as the shorthorn breed.

On the other hand, Aiton, who wrote a survey of the county, and was himself a farmer in the district of Cunningham, after diligent and careful inquiry into the origin of the breed, was of opinion that they are descended from the native cattle, changed in their colour and partly in their shape, size, and qualities, by being crossed with the Teeswater or Dutch breeds. Such are

the opinions of early writers, and although their accounts differ slightly in detail, they all agree in one point—that the Ayrshire cattle are the result of a cross between the native type and some foreign breed or breeds.

Although the improvement in Ayrshire cattle dates from the year 1750, it cannot be said to have become anything like universal until about the year 1780, when a much better system of farming was adopted, more attention was devoted to the breeding and rearing of stock, and a much more generous fare was substituted for that which was barely necessary to sustain life. Higher rents were demanded, and these served as a stimulus to industry; for, as the clay soil was in excess, and liable to be poached if worked under the almost continual dripping of the clouds, more attention was devoted to dairy farming than to the growth of wheat or other cereals.

Thus the race of Ayrshires was ameliorated step by step, until it has attained its present state of perfection. A considerable time has elapsed since the improved breed was established in every district of Ayrshire proper, as well as since its adoption in many other counties. A Mr Fulton is said to have first planted it in Carrick about the year 1790; while a Mr Ryan established the first herd in Wigtownshire, on the south side of Lochryan, in the year 1802. Towards the end of last century several cattle were introduced into Dumfriesshire, having been brought to the estate of Mr Hope Johnstone of Annandale. Altogether, dairy farming spread rapidly towards the close of last, and in the beginning of the present, century, and in most of the south-western counties of Scotland the Ayrshire breed is gradually supplanting others.

Some of the most noted dairy farmers and breeders of stock in the county of Ayrshire are—Mr Andrew Allan, Mumnoch, Dalry, who has a dairy of about 75 cattle, and who bred the cow which took first honours at the Highland Society's Show at Glasgow this year (1875); Mr J. N. Fleming, Knockdon, Maybole, well known as a prize-taker, and generally acknowledged to have the best Ayrshires in Scotland; Mr J. Parker, Broomlands Kilmarnock; and Mr J. Howie, Burnhouses, Kilmarnock.

In the district lying around East Kilbride, Lanarkshire, are also some noted herds. Particularly may be mentioned as owners—Mr Thomas Ballantyne, Netherton; Mr John Hamilton, Skeoch; Mr George Crawford, Bogside; and Mr William Craig, Cruthertland,—all having been prize winners for Ayrshire dairy cattle.

In Stirling, fine herds are owned by the following:—Mr Duncan Keir, Bucklyvie; Mr W. A. M'Lauchlan, Auchentroig, Balfron; and Mr Hugh Fleming, Ballaird, Balfron.

At Holestane, in Dumfries, His Grace the Duke of Buccleuch has a fine herd of thirty years' standing. It consists of 40 cows with their followers—viz., 7 bulls, 24 queys rising three years

old, and 32 rising two years old. Surplus milk, formerly made into Cheddar cheese, but now into Dunlop. Many of the animals are noted prize-winners.

It would serve no useful purpose to enter into a long list of the names of breeders in each county; suffice it to say that there are in most of them many pioneers, who are sparing neither pains nor expense to bring the Ayrshire to the highest possible state of perfection.

It may be mentioned that here and there a herd of Ayrshires has been planted on the English side of the border. Mr Alexander M'Caw, of Greysouthen, near Cockermouth, Cumberland, has a standing dairy of 100 Ayrshire cattle, the produce of which is mostly made into cheese, for which there is great demand, as cheese-making is a branch of husbandry very little understood or practised by the north of England farmer.

Prices of young stock vary according to age and quality, and milch cows range from L.12 or L.14 to L.18 or L.20. For good bulls, high figures are occasionally given.

Points of Ayrshire Cattle.

The modern Ayrshire has well defined characteristics, which are unmistakable by the observer when once understood. The horns are small, wide apart at the base, have an upward inclination and a graceful curve inwards. The head is small; the neck long and fine where it joins the head, but gradually thickening to where it is set upon the shoulders. The forequarters in general are thin, the body developing gradually towards the hinder parts. The colour is brown, mixed more or less with red, the markings being clearly defined; while the skin is soft, pliant, and pleasingly elastic to the touch. The thighs are deep and broad, and the legs short. The udder is large without being flaccid; well developed without being cumbersome. Indeed, the general contour of the Ayrshire betokens milking capacities of no mean order. There is very little coarseness about the true breed, most of the points being what *connoisseurs* call "good."

The most approved form of the best milkers is thus described by Mr Aiton:—Head small, but rather long and narrow at the muzzle; the eye small, but quick and lively; the horns small, clear, bended, and the roots at a considerable distance from each other; neck long and slender, and tapering towards the head, with little loose skin hanging below; shoulders thin; forequarters light and thin; hindquarters large and capacious; back straight, broad behind, and the joints and chine rather loose and open; carcass deep, and the pelvis capacious and wide over the hips; tail long and small; legs small and short, with firm joints; udder capacious, broad, and square, stretching forwards, and neither fleshy, low hung, nor loose, with the milk-veins large and prominent; teats short, and at a considerable distance from each

other; the skin thin and loose; hair soft and woolly; the head, horns, and other parts of least value small, and the general figure compact and well proportioned. There is to the present day much dispute with regard to the origin of the Ayrshire cow.

The following description from a report to the Ayrshire Agricultural Association gives the points which indicate superior quality in the Ayrshire dairy cows:—

Head short, forehead wide, nose fine between the muzzle and eyes, muzzle moderately large, eyes full and lively, horns wide set on, inclining upwards, and curving slightly inwards.

Neck long and straight from the head to the top of the shoulder, free from loose skin on the under side, fine at its junction with the head, and the muscles symmetrically enlarging towards the shoulders.

Shoulders thin at the top, brisket light, the whole forequarters thin in front, and gradually increasing in depth and width backwards.

Back short and straight, spine well-defined, especially at the shoulder, the short ribs arched, the body deep at the flanks, and the milk-veins well developed.

Pelvis long, broad, and straight, hock-bones (ilium) wide apart and not much overlaid with fat, thighs deep and broad, tail long and slender and set on level with the back.

Milk-vessels capacious and extending well forward, hinder part broad and firmly attached to the body, the sole or under surface nearly level, the teats from two to two and a half inches in length, equal in thickness, and hanging perpendicularly; their distance apart at the sides should be equal to about one-third of the length of the vessel, and across to about one-half of the breadth.

Legs short, the bones fine, and the joints firm.

Skin soft and elastic, and covered with soft, close, woolly hair.

The colours preferred are brown, or brown and white, the colours being distinctly defined.

Great value is attached to the above form and points by the dairy farmer, and he quickly takes them in when effecting a purchase, so that a mistake is rarely made. The following ingenious versification of the points of an Ayrshire cow are based on a document published under the authority of the Ayrshire Agricultural Association:—

Would you know how to judge of a good Ayrshire cow?
Attend to the lesson you'll hear from me now;
Her head should be short, and her muzzle good size;
Her nose should be fine between muzzle and eyes;
Her eyes full and lively; forehead ample and wide;
Horns wide, looking up, and curved inwards beside;
Her neck should be a fine tapering wedge,
And free from loose skin on the undermost edge;
Should be fine where 'tis joined with the seat of the brain;
Strong and straight upper line without hollow or mane;

Shoulder-blades should be thin where they meet at the top ;
Let her brisket be light, nor resemble a crop ;
Her fore-part recede like the lash of a whip,
And strongly resemble the bow of a ship ;
Her back short and straight, with the spine well defined,
Especially where back, neck, and shoulders are joined ;
Her ribs short and arched, like the ribs of a barge ;
Body deep at the flanks, and milk-veins full and large ;
Pelvis long, broad, and straight, and in some measure flat ;
Hock-bones wide apart and not bearing much fat ;
Her thighs deep and broad, neither rounded nor flat ;
Her tail long and fine and joined square with her back ;
Milk-vessel capacious, and forward extending,
The hinder part broad and to body fast pending ;
The sole of her udder should just form a plane,
And all the four teats equal thickness attain ;
Their length not exceeding two inches or three ;
They should hang to the earth perpendicularly ;
Their distance apart, when they're viewed from behind,
Will include about half of the udder you'll find ;
And when viewed from the side, they will have at each end
As much of the udder as 'tween them is penned ;
Her legs should be short and bones fine and clean,
The points of the latter being quite firm and keen ;
Skin soft and elastic as the cushions of air,
And covered all over with short woolly hair ;
The colours preferred are confined to a few,
Either brown and white checkered or all brown will do ;
The weight of the animal leaving the stall,
Should be about five hundred sinking offal.

Such are the points of the Ayrshire as they were formerly considered, and the scale has changed little up to the present day. The arrangement is judicious in most respects, all the points being bestowed upon what may be termed the local indications of milk. The dairyman seems thoroughly to understand the essential features which betoken milk-giving propensities, caters for them, and fixes them accordingly.

Breeding, Rearing, and General Management of Stock.

The Ayrshire dairy farmers are very particular in the breeding of their cattle. In order to secure the milking-properties as far as possible, they select a bull possessing so much of the feminine aspect as pertains to the neck, head, and forequarters ; having also sufficient breadth between the hocks and fulness in the flanks. They prefer that the scrotum be white ; indeed, so much attention is paid to this point, that many breeders would reject an animal if the part in question were of any other colour. When a bull is selected from a herd, other than that in which he is required to serve, great care is taken that he be descended from a stock noted for its milking qualities, independent of the virtues which he himself possesses. The purchaser satisfies himself that the mother of the bull was a strong, profitable cow, for he knows

that the maternal parent of the sire has a most unmistakable influence over the progeny for many generations. Indeed, the aim of the dairyman is to cultivate a race of cattle noted alike for their harmony of colour, beauty of contour, and fill-pail proclivities.

Whatever is due to the introduction of and crossing with foreign animals, and also to the superior food which the cattle of the present day receive compared with the meagre fare of last century, there can be no doubt that the world-wide repute which the Ayrshire has at length gained as a milker is mostly owing to the selection of animals for breeding purposes. In the female the better milker is always retained, while the poorer is rejected, the dairyman having great faith in the adage that "like produces like." Those exterior outlines which experience shows exist in the better cows are sought for in the younger cattle, and aimed at in the coupling. Thus, the modern Ayrshire has, as it were, by degrees been built up, until she is a milker of unsurpassed excellence, her form according with that which indicates this faculty. Her udder has become developed in size, perfected in shape, and extended to a wonderful degree of capacity; her soft woolly coat protects her body from the rough storms which now and then sweep across the Atlantic; while her body is light before and heavy behind, for the breeder knows that such characteristics are a sure guarantee of milking capabilities. The advance has been gradual for almost a century, each step having been fixed as it was gained. Her type is the type sought for by dairy farmers, not only in Ayrshire, but in the adjoining counties of Western Scotland as well—from the Grampian Mountains to the Solway Firth and the Cheviot Hills. Neither is the neat, little, milk-giving Ayrshire confined to its native country. It is sought after to crop the verdant pastures of different parts of England; it graces many dairy farms in Holland; it has crossed the wide Atlantic, and feeds along the northern as well as the southern shores of the river St Lawrence, or rests beneath the shadows of the Rocky Mountains. A reference to the prevailing points of six noted dairy breeds will suffice to show that the characteristics of the Ayrshire stamp her as a dairy cow of a high order, viz., the Fifeshire, as described by Magne; the Yorkshire, which is the unimproved shorthorn, by Haxton; the Jersey, by Allen; the Suffolk, by Kirby; the Brittany, by Gamgee; and the Ayrshire, by Aiton. The points which predominate are the following:—

Head, long.
Muzzle, fine.
Throat, clear.
Neck, slender.
Shoulders, thin.
Chest, deep.
Brisket, small.
Back, straight.
Thighs, flat and thin.
Ribs, arched.
Pelvis, roomy.
Belly, large.
Legs, small and short.
Udder, large, square, and well-formed.

The management of Ayrshires varies slightly in detail, owing to circumstances, but, as a rule, the dairy cattle calve in March and the beginning of April. During the time that the cows are dry, they are fed in the byre, chiefly on oat straw and turnips, until about a month before calving, when their dietary is slightly improved. After calving, they are fed upon hay with boiled turnips and chaff, mixed together; or cut hay with bean-meal. Many adopt the practice of boiling the turnips and chaff in the same cauldron for several hours, and then adding a little bean or pea meal. This makes a nourishing diet, and one which the cows eat with avidity. The mixture is given twice a-day, as much sweet hay as the cows will eat up clean being supplied at other times between the morning and evening meals. Cattle so fed produce large quantities of rich, well-flavoured milk. The following is the mode of feeding adopted during a milking competition of Ayrshire cows :—

One bushel draff, mangold, bean-meal, oatmeal, and mangold juice with oatmeal. Mangold boiled, and bean-meal. Cut grass with 2 lbs. bean-meal, 1 lb. oatmeal, 1 lb. bran, and ½ lb. oilcake.

Of course the above method of feeding is entirely extra, the aim being to promote the secretion of milk as much as possible, regardless of expense.

When the pastures contain a nice bite, which in ordinary seasons is about the 12th of May, the cows are liberated from the byres, and allowed to forage for themselves. In very hot weather, they are kept in during the day, and supplied with cut grass, being turned into the fields only at night. In moderately cool weather, soiling is discontinued. During autumn, the cows are partly fed upon second clover and partly upon turnips, the latter being thrown upon the pastures. In October, the milch cattle are housed at night, receiving straw morning and evening, and turnips by day. Up to the 1st of December, when the cows are put dry, they get hay and roots,—potatoes or turnips,—after which their fare is reduced to straw and turnips.

Comparatively few pure-bred Ayrshire steers are reared for grazing, the male calves being usually sent to the butchers when young. The heifer calves are supplied with milk for a period varying from six to nine weeks, when they have sour milk or gruel for another month. They are allowed to run upon an old-laid pasture till the month of August, being then removed to the hay-foggage to get them up in condition, as sudden thriving in calves is said to encourage "Black Spaul." They thus retain their calf-flesh, and remain in good condition during the winter, if liberally treated.

They are again sent to the moors the second summer, and brought home to good grass in the autumn. They are then six quarters old. When taken up, the young cattle are allowed a

portion of hay or mash with their straw and turnips. About February the in-calf heifers are supplied with a little meal to make good the drain of nourishment caused by the growth of the calf. It is considered dangerous, however, to feed very heavily, until a little while after calving; then a more liberal diet is given, and the young cow brought into full milk.

Here a point crops up which has provoked much discussion in agricultural circles, viz., as to whether it is more profitable to have heifers in profit when they are between two and three years old, or a year later. It is generally conceded, and experience bears the theory out, that cows between two and three years of age not only give more milk during the first season than those of a more advanced age, but that they continue better milkers in after years. The reason assigned for this is, that they become in calf at a time more in accordance with the promptings of nature, and that, therefore, the milk flows more copiously. However, bringing cattle into profit so young is thought by some to be hurtful in stunting the size, and preventing them from getting a desirable amount of bone; while others, on the contrary, urge that the extra diet which they receive when milking, develops them quite as much as running free another summer upon a bare moor.

In some districts, dairy cattle are let out to men called "bowers" for the season. These bowers either pay a fixed rent for each cow in money, or deliver so much cheese at the end of the year, as may be agreed upon. The farmer supplies pasture for the summer months, and a regulated quantity of feeding-stuffs for the winter; the usual allowance being five or six tons of swede and common turnips per cow, with $2\frac{1}{2}$ cwt. of bean-meal, and hay and straw. The herd, with his family, performs all the necessary labour in attending to and feeding the cattle, as well as the making of cheese. The payment which the herd is called upon to make depends much upon the quality of the pastures, the value of the produce, &c., but the usual rates are L.11 to L.14 when paid in money, and 3 to 4 cwts. of cheese when paid in kind.

Produce of the Ayrshire.

Enough has already been advanced in favour of the Ayrshire as a milker. It is a well-established fact that no breed of cattle in the British islands will produce an equal quantity of milk, butter, and cheese from a given amount of food with the pure-bred Ayrshire. Of the precise yield of milk which a cow gives, it is difficult to speak with any degree of certainty, so much depending upon the size, breeding, and age of the animal; the quantity and quality of the food given, the attention to milking, and regulation of the byre-work, together with many other circumstances, having a certain amount of influence in determin-

ing the quantities of milk given by individual cattle. Aiton, in his "Survey," says that some cows produce 5 to 6 gallons per day for a time. Long after committing this statement to paper, he was led to believe that he had underrated the quantity, as he was informed that many cattle yield 6 to 7 gallons per day for six or eight weeks; but these, he remarks, are extraordinary returns. Several, when in their best plight and well fed, will yield 4 gallons per day for three months, and produce a total of 800 to 900 gallons per cow. As an average, 600 gallons per cow for the year has been mentioned, but on the poorer farms the average yield falls far short of this, and cannot be more than 480 or 500 gallons.

There are various methods of converting the produce of the dairy into cash, dependent chiefly upon the extent of the farm, the quality of the soil, the circumstances of the dairyman, and the proximity, or otherwise, to a town. The owners of small dairies, if possible, dispose of their produce as new milk in a neighbouring town; the occupiers of the largest class of dairies generally go in for cheese-making; while the produce of medium-sized dairies is sold as milk, converted into butter, or made into cheese; sometimes a combination of two or more of the above methods is observed, as circumstances render desirable.

The following details show the comparative advantages of each system, as well as the actual amount of produce obtained on several dairy farms, names being withheld by desire.

No. 1 is a dairy of 10 cows. The milk is disposed of daily at 10d. per gallon. The average for 250 days was last year $2\frac{1}{2}$ gallons per cow, giving a yearly total of 625 gallons for each. Value of whole produce for the year, L.26, 0s. 10d. About L.4 per head spent in artificial food.

No. 2 is a dairy of 16 cows. Average for 240 days, 9 quarts per cow daily. Value of produce, L.22, 10s. A little over L.3 spent on extra food.

No. 3, dairy of 24 cows. Milk made into butter. Average per cow throughout season, nearly $5\frac{1}{2}$ lbs. per week, or an aggregate of 220 lbs. per cow. This, calculated at 1s. 3d. per lb., with L.3, 10s. for milk, brings the amount per cow up to L.17, 5s. Cash spent on food, about L.2, 15s. per head.

No. 4, dairy of 14 cows. Milk also made into butter. Average, 240 lbs. for year. This, estimated at 1s. 4d. per lb., as advised, makes L.16. Butter-milk valued at L.4, making the total sum L.20. Feeding substances purchased in, L.3, 4s. 8d. per cow.

No. 5, dairy of 75 cows. Produce made into Cheddar cheese. 4 cwt. average per cow. Sold at 70s. per cwt., or a total per cow of L.14. No estimate of milk or whey given.

Where the milk can be disposed of daily as obtained, the

returns are the largest; but such farms are said to be privileged, and rents are consequently higher.

For the sake of comparing the three methods of disposal, an example may be adduced. In the suppositious conversion of milk into butter and cheese, the usual recognised standard is observed, viz., $2\frac{1}{2}$ gallons of milk to 1 lb. of butter, and 1 gallon to 1 lb. of cheese, although some dairymen now calculate 30 gallons of milk to 24 lbs. of cheese. Say an average dairy cow, with moderately liberal diet, yields 600 gallons of milk per annum, the following results are obtained :—

		£	s.	d.
(1.)	600 gallons of Milk, at 10d. per gal. . .	25	0	0
(2.)	240 lbs. Butter, at 1s. 4d. per lb. . . .	16	0	0
	Estimated value of Butter-milk, . . .	3	10	0
	Total,	19	10	0
(3.)	$5\frac{1}{4}$ cwt. of Cheese, at 70s. per cwt. . . .	18	7	6
	Estimated value of Whey, ...	2	0	0
	Total,	20	7	6

It appears that of the three systems, the sale of the produce in the shape of milk is most profitable; that cheese-making stands second, and butter last. Of course, the prices current for the different articles would render the returns variable, but it is usually understood that milk selling is the most advantageous where there is sufficient off-gate for the produce, inasmuch as milk is an exceedingly perishable article, and cannot easily be conveyed long distances, so that competition is to a certain extent prohibited.

The following figures show the result of a milking competition held at Ayr on the 26th and 27th days of April 1861, viz. :—

Name of Owner.	Greatest Milking.		Average of Four Milkings.		Weight of Butter.	
	lb.	oz.	lb.	oz.	lb.	oz.
A. Wilson, . .	28	12	24	$3\frac{1}{2}$	2	2
J. Hendrie, .	26	0	24	5	2	$14\frac{1}{4}$
W. Reid, . .	25	7	20	$8\frac{3}{4}$	2	9
W. Reid, . .	30	15	27	$5\frac{1}{2}$	3	$6\frac{1}{2}$
R. Wallace, .	28	14	28	$8\frac{1}{5}$	1	$9\frac{1}{2}$
R. Wallace, .	25	5	23	$8\frac{1}{2}$	1	15

In the above competition, the greatest yield at a single milking was rather over 3 gallons, which produced at the rate of 15 lbs. of butter per week. But being a competition, and the cows

highly fed, the returns afford no fair criterion of the ordinary milking capacities of an Ayrshire cow.

At a milking competition in Holland, held in the year 1872, three Ayrshires gave 5386 quarts during the season, being an average of 1795$\frac{1}{3}$ each, or 4$\frac{92}{100}$ quarts per day for the whole year. The rich grasses of Holland, however, tend to make the cattle produce fat rather than milk.

It is said that an Ayrshire cow, bred by Mr Finley of Monkland, near Glasgow, gave 36 quarts daily for six months. This, reckoned at one shilling per imperial gallon, amounts to L.81. The cow was, doubtless, a wonderful exception. It is further stated that the cow was sold to go to Beacon Farm, America, and that a year ago, after producing her thirteenth calf, was giving 23 quarts daily. Her progeny have been scattered over Georgia, Mississippi, and Tennessee, and their descendants are eagerly bought up by the dairymen of Yankeeland.

The milk of the breed in question is exceedingly rich in quality. Its predominant feature consists in the large globules which it contains, and its adaptability for either butter or cheese making. Still two distinct classes of cattle might be selected—butter and cheese makers. The latter furnish a large secretion of milk, containing a smaller globule, and more numerous granules than does the milk from the butter family. Many cattle possess both the butter and cheese making faculties in a remarkable egree.

The Making of Cheese.

The limited space at command in this paper precludes the possibility of entering into a lengthened dissertation on cheese-making; it, however, may be stated that there are two systems—the time-honoured Dunlop, and the Cheddar system, each of which has its zealous advocates. The latter has gained considerable ground of late years, especially in large dairies. One great advantage the Cheddar cheese has over the Dunlop is, that it stands more heat in the cheese room, and is, consequently, sooner ripe for market. The method of making Cheddar cheese is briefly as follows. Two meals of milk are taken together, the cold milk being heated until the temperature of the whole—cold and new—reaches 90 degrees. The colouring is then added, next the rennet, with a little sour whey; the whole, after being well stirred, is allowed to stand till thickened, which should be in an hour or less. The curd is then broken. When reduced into small pieces about half an inch square, it is left to stand a little while to allow the whey to rise to the top. This done, the whey is taken off and heated to 150 degrees. Meantime the curd is broken quite as small as the grains of wheat. When the whey is heated it is again put on, thus raising the temperature of

the curd to about 80 degrees in summer and 88 in winter, twenty minutes being allowed for the mass to settle. The whey is taken off a second time, heated and put on, thus raising the temperature to 100 deg. in warm, and 105 in cold weather. The curd is once more allowed to settle, and the whey finally poured off. The curd is then laid out to cool, after which it is put in the press for a little while, taken out, milled and salted—1 lb. of salt being used to 56 lbs. of curd. The substance is then put into the press-vat at a temperature of 66 to 68 deg., great care being taken to obtain the proper heat; for, if too warm, a portion of the fat is sent off, and if too cold, all the whey and acid will not be separated from the curd. On the fourth day, the cheese may be taken from the press, neatly bandaged, and put into the cheese-room, which should be well ventilated and furnished with a stove.

Feeding Qualities of the Ayrshire and its Crosses.

Although the Ayrshire cow is bred chiefly for milking purposes, she also fattens very quickly when put dry, for the same functions which ordinarily fill the udder, also cover the frame with fat. Cows are fed off at various ages. If any decline in milking qualities is noticed, some are fed off at seven years, others are kept until nine, while extraordinary pail cattle are sometimes kept until they are advanced in their teens. It is astonishing how rapidly those aged cattle thrive when put upon a nice sweet pasture, the herbage of which is somewhat richer than that to which they have been accustomed. The Americans have also found out this quality which the breed possesses. One farmer, whose dairy stock is entirely composed of Ayrshires, says, "The Ayrshires are hardy and thrifty, are easily fattened and make good beef, while for milking, in our country, are infinitely better than any breed I have ever seen. They will fatten where a Durham cow would keep as poor as a rail, and I have known them to furnish from 500 to 600 lbs. of dressed meat. There are no better feeders, and their flesh is as fine as anybody wants. In colour and shape I consider the Ayrshire as attractive as most breeds, not much inferior to the Shorthorn, and vastly superior to the fancy Alderneys, which are so difficult to get into butchers' condition."

When crossed with a shorthorn, the progeny are excellent types for grazing; they lay flesh on quickly and make heavy weights. Many dairy farmers either keep, or have access to a Shorthorn bull, using their favourite milkers for breeding Ayrshires solely for dairy purposes, and the remainder of the stock for breeding shorthorn crosses for grazing. Galloway crosses also thrive well; they are "kindly doers;" they lay on a maximum amount of flesh with a minimum amount of food, and

are therefore in great repute in many districts. Indeed, the majority of practical graziers north of the Tweed are of opinion that the Galloway-Ayrshire cannot be surpassed as a grazing description. The male is generally on the Galloway side. The descendants have the reputation of arriving early at maturity, fattening on what may be termed second-rate pastures, and making highly profitable weights. On many high-lying farms the cows are crossed with a Galloway bull; the produce reared on the farm and sold off to graziers, or made fat at two to two and a half years old, making from 13 to 14 stones per quarter. The Galloway crosses are best adapted for the high moors, being of a hardy character; the shorthorn crosses for the Lowlands, where the climate is more genial, and the herbage of better quality.

Conservation and Improvement.

Notwithstanding that many even noted dairy farmers are opposed to pedigrees other than such as the cattle "carry along with them," yet it is evident that a herd-book containing a faithful record of how each notable animal was descended, would not only enhance its value considerably, but would furnish a guide which would be invaluable to Ayrshire purchasers. Moreover, it would serve as a sort of history to the future generation of breeders, while its perusal would be a source of gratification to every admirer of this wonderful milk-producing race. Such a book the Americans have already published, a fact which shows clearly in what great esteem the Ayrshire is held over the Atlantic. High prices are now and then given for cattle which have distinguished themselves at shows, as far as L.50 to L.60 having been paid for a single animal for exportation. Some of the most noted breeders often sell animals at long prices to be retained at home, but the caterers for export purposes generally out-bid the local dairy farmers.

Judicious feeding and careful management also tend to bring out the essential characteristics of the type; but it should always be borne in mind that there is a limit even to liberal or generous treatment, as pampered cattle succeed for a time only, if at all. It may be further stated that nature undoubtedly designed the Ayrshire cow to be the creature of a certain locality, to which she has in the course of time become thoroughly acclimatised, and is now admirably adapted to all the varied surroundings. Remove her to a colder climate and a more barren soil, where the fare falls short of that produced by her native land, and she soon shows symptoms of decline; transport her to a more genial climate where the herbage is luxuriant, and her milking properties give way, while her fattening qualities are more prominently developed.

In order, then, to retain all the excellent points and propen-

sities which the Ayrshires possess, and also to improve upon them as much as is consistent with the laws of nature, care in selection, care in rearing, care in feeding, and care in preserving a true record of all animals that excel, are points worthy of observation; avoiding, at the same time, extremes in over-feeding or pampering, too-fine crossing, and transporting to climes and pastures unsuited to the race.

The above are, in the opinion of many enlightened dairy farmers, some of the measures which might be adopted, keeping in view the conservation and improvement of the Ayrshire breed of cattle.

ON THE WEST HIGHLAND BREED OF CATTLE.

By Thomas Farrall, Aspatria, Carlisle.

[*Premium—Ten Sovereigns.*]

Early History.—Beyond the records of history, the Highlands of Scotland have been occupied by vast herds of cattle, which have at length acquired a character suited to a country of high mountains and rough-grown heaths. In the northern parts of the country, the cattle had the name of North Highlanders bestowed upon them, while for ages those inhabiting the western sea-board and the adjoining islands were known as West Highlanders. Owing to the mountainous character, and close proximity of this part of Scotland to the sea, the rainfall is considerable, being from 30 to 40 inches on an average annually; yet the climate, though subjected to violent storms, is not so cold as might naturally be supposed from its northern position, the waters of the Gulf Stream having a wonderful effect in preventing extremes of heat and cold. This comparative mildness and extreme humidity of climate, together with the peculiar nature of the soil, tend to produce a luxuriant growth of coarse grass and herbaceous plants, interspersed with patches of heath, thus affording sustenance to a hardy race of animals such as the West Highlanders have proved themselves to be. The extension of sheep-farming of late years has doubtless been the means of displacing a large number of this breed, but it is questionable whether any class of animals can be found better adapted to the peculiarities of soil, climate, and geographical position than the shaggy Kyloe is. Notwithstanding that the numbers have been lessened, it may be remarked that the breed has been preserved in a remarkable degree of purity; unlike the North Highlanders, which have been so much changed in appearance by the continued ingrafting of shorthorn blood, that it is now difficult to find an animal of the original

type, so that a pure-bred North Highlander, if such can be found, may justly be regarded as "a lonely straggler of a vanishing race."

Characteristics of the Breed.—Perhaps no cattle are possessed of more distinctive and strongly-marked features than the West Highlanders. The following marks or characteristics stamp the genuine breed:—Their limbs are short, but muscular; their chests wide and deep; their ribs well developed and finely arched, and their backs as straight as in the pure-bred shorthorn; their neck and dewlap are somewhat coarse in the bull, but this is indicative of its mountain state; their horns of good length, without approaching to the coarseness of the longhorns of the lower country, spreading and tipped with black; and all the other points are what breeders call good. There is, indeed, much in the West Highlanders to arouse the attention and win the admiration of those who love to see animals in an undomesticated state. The beautiful and imposing colour of brindle, dun, cream, red, or black; the finely-arched ribs and level back; the deep and well-formed chest; the splendid horn; the lively, quick, and fearless eye; the broad muzzle; and the shaggy coat, impart to the Kyloes charms which are not to be found in any other British breed. Their action, too, is of the most graceful kind. Whether seen ascending their native rugged slopes, moving about upon the market stance at Falkirk, or besporting themselves in the nobleman's park, there is a peculiar freedom of motion which is quite foreign to all pampered breeds. Lovers of the picturesque rarely meet with a more gratifying sight than a mixed herd of Highlanders on a Scottish landscape—it is a scene well worthy of the imitative pencil of the artist. The farmers of the West Highlands wish to cultivate the black colour as much as possible, as they think it indicative of hardiness—hence the vast numbers of that colour. Altogether, it may safely be said that there are few breeds of cattle which are so graceful in form and colour, and so majestic in gait and movement as a thoroughly well-bred Highland bull or ox, cow, or heifer.

Districts where found.—It has already been stated that there is a difference between the North and West Highland cattle, although both breeds are frequently spoken of in general terms as "black cattle." The North Highlander has almost lost its distinctive character by repeated crossings, while the pure Highlander is now chiefly confined to the counties of Argyll, Inverness, Perth, and Dumbarton, although there are, of course, solitary herds to be found throughout both Scotland and England. For example, at Greystoke Castle, in Cumberland, a standing herd, numbering upwards of twenty breeding cattle, has been kept for many years, having the range of a large park containing several

hundreds of acres. The calves are allowed to run with their dams until the month of October, when a general weaning takes place, the average age being from five to six months, and a very difficult and hazardous undertaking the weaning process is, for the means of offence and defence with which the Highland cow is furnished are not to be lightly considered. After weaning, and indeed throughout winter, the calves have the use of an open shed, wherein they are supplied with a bit of meadow hay at night. The two and three-year olds are also similarly treated; having, in addition, a few turnips thrown upon the pastures. The heifers selected for breeding are kept from the bull until three years old, when they attain a much larger size than if put to breeding earlier. Bullocks are fed off at four years, either upon the pastures in summer, or upon hay and cake in winter, with turnips supplied *ad libitum* in the fields. At this age, they attain a weight of from 14 to 15 stones per quarter, the draft heifers making 10 to 12. Of late the bullocks have been fed off at three years old, thus saving a year's keep—a very important consideration in those days of dear provender—and the practice has been found to answer admirably. The colours which the owners admire most are the dun, the brindled, and the red, but since the breeding-in-and-in system has not been sufficiently checked, there is a decided tendency to drift back to the original black colour; this, the owners believe, is a significant fact that deterioration is taking place.

The Mainland and Island Cattle contrasted.—The cattle produced on the mainland of Scotland are generally much superior in bone, frame, and general substance to those reared upon the islands, but the latter produce hair and horn, such as those on the inland pastures can never compete with. Indeed, it is a fact worthy of consideration, that the nearer an approach is made to domestication, the heavier is the weight of flesh, although, it must be admitted, that the quality is to some extent sacrificed. It may fairly be asked, How is this? Simply because nature has supplied herbs in the greatest profusion and variety where the least artificial influences have been brought to bear on the soil. It is well known that the sweetest mutton is produced on the unbroken sheep pastures, and the mountain-deer of Scotland have a much more "gamy" flavour than the venison produced in the deer parks of England. The best milk and butter are also obtained from cattle grazing on old laid pastures, so that from these examples a truism is apparent—viz., that domestication and high feeding gain weight at the expense of quality. Amongst those who appear to have taken the lead in the improvement of this noble breed may be mentioned Mr M'Donald, Monachyle, whose bulls were keenly run after; Mr M'Laren, Callander; Sir Neil Menzies of

Menzies, and Mr M'Laren in Rannoch, whose united stocks are still kept up by the Honourable Lady Menzies on a large scale; and the Messrs Stewarts in Glenlyon.

The Mainland Herds.—One of the finest herds of cattle to be found on the mainland of Argyll is that belonging to Mr Malcolm of Poltalloch, a name known throughout Scotland as being frequently connected with "ribbons and medals" at the principal shows. As far back as 1844, the three beautiful heifers and four prime steers shown by Mr Neil Malcolm at the Highland and Agricultural Society's Show at Glasgow, were the theme of admiration in West Highland fancying circles. Careful selection in animals for breeding, and due attention to rearing, have raised the character of the herd at Poltalloch to a pitch of excellence which is difficult to rival. In winter the herd is well cared for, ample shelter has been provided, and the times of feeding are noted with praiseworthy regularity. It may be remarked that the Argyllshire Highlanders are in great repute in some parts of England; indeed, so partial are buyers, that they can scarcely be prevailed upon to purchase stock from any other quarter.

The Earl of Seafield has in recent years established a herd at the home farm at Castle Grant, which bids fair to acquire fame. He obtained many of his best cattle from some of the noted districts of Perthshire, and has since made choice selections from other herds of repute. Both bulls and cows from this stock have taken honours at the Highland Society's Show, as well as other local shows.

There is a very large fold in Badenoch, the property of Mr M'Intosh, South Kinrara. This herd is of long standing, and includes many nice animals, although perhaps there is a deficiency of horn and hair in some of the cattle.

The herd owned by the late Marquis of Breadalbane was, at the time of his death in 1862, said to be one of the finest in Scotland. Lord Breadalbane took an active interest in his stock, selecting animals from the most famous herds in Rannoch, Glenlyon, Callander, Balquhidder, and other noted districts. In this he was assisted by one of the ablest judges of Highland cattle in Scotland—the late Mr John Stewart Menzies of Chesthill.

The Breadalbane herd was dispersed during the year succeeding the noble Lord's death. The principal purchaser was the late Duke of Athole, who, in addition to his fine stock of Ayrshires at Dunkeld, was desirous of possessing a herd of West Highlanders at Blair-Athole. His Grace had an able adviser in Mr Fletcher Norton Menzies, now secretary of theHighland and Agricultural Society, who was well acquainted with the Breadalbane herd, and who selected for him a magnificent drove to roam on the fine pastures of Glen Tilt. Various animals from

this herd have oftentimes come off conquerors at the "peaceful battles" which are held year after year in the various showyards. Some of the animals shown are said to possess many of the valuable characteristics of the shorthorn as to shape, size, and general contour. A Highland three-year old ox of this stock, shown by the Duchess-Dowager of Athole at Perth in 1871, was considered by eminent judges to be a perfect model of its race. The herd is still kept in good style by the present Duke. The late Mr Robert Peter, Urlar, near Aberfeldy, possessed a very fine little herd, with which he was frequently successful at the Highland and Agricultural Society's and other shows. This stock is still kept up by his trustees.

The herd of Mr Stewart, Bochastle, Callender, must be noticed as well managed and possessing very good points, especially as to hair and horn. He is a successful exhibitor.

At Faillie, about seven miles to the south of Inverness, is a large herd of West Highlanders, the property of Mr Alexander Fraser. It was established about forty years ago by the present owner's father, the foundation having been laid by the purchase of three heifers from the famous Dunrobin breed. Bulls were selected from the districts of Balquhidder, Rannoch, and Glenlyon in Perthshire, and the best folds in Skye. The herd numbers about 24. A few of the older cows are drafted off annually, so that the stock is kept in a vigorous condition. The cattle yield a large amount of dairy produce, but they are liberally treated all the year round. When the pastures fail in summer, they have vetches or grey pease; and in winter they are fed upon hay, straw, and turnips. The stot stirks bring from 9 to 10 guineas per head, and what heifers are not wanted to supply the place of drafted cows also realise high rates.

Mr M'Gillivray has about 20 prime Highland cows at Ballochroan; and Mr M'Pherson of Invertromie also owns some very nice cattle. Others might be named, as Mr Grant, Inverlaidnan, Carr Bridge; Mr Davidson, Gordonhall; and the late Mr M'Donald, Strathmashie, all of which have the repute of breeding and rearing prize winners. Several very famous mainland herds have been dispersed within the past twenty years, and while this has had a tendency to curtail the aggregate numbers of West Highlanders, it has at least been the means of improving many existing herds, giving as it were, a "pedigree" to several stocks which were previously quite unknown to fame.

Island Herds.—In the western islands there are also some nice herds of this breed. Indeed, the West Highlander is the type almost exclusively reared, and no other variety seems to be so well suited to the surroundings. Commencing with Islay, the herd at Lossit, the property of Mr M'Neill, claims first attention, as it is the largest in the island. Several of the cows

have from time to time been prize-takers at the Islay, Jura, and Colonsay Agricultural Society's exhibitions, and many others not included in this category are undoubtedly animals of merit. The stock here are by no means pampered. Indeed their lines are not cast in pleasant places. The heifers for breeding are turned upon the bleak moors, and produce the first crop of calves when they are about four years old. In-breeding is loudly deprecated, and the strain is from time to time renovated with fresh blood through sires from other noted herds. In the younger animals, there are some perfect beauties, both in style and coat, the latter being of the finest texture.

Mr Webster of Daill has a herd consisting of between 40 and 50 cows. The young cattle are fed upon the hills or moors, and when they attain a riper age, they are brought down to the richer pastures below. Here they thrive rapidly, and prove, by their marked progress, the capabilities of the breed. A few years ago Mr Webster used a yellow bull from the Jura herd, and it was curious to observe how he impressed his likeness upon the calves. Although bred chiefly from black cows, they were mostly of a yellow or yellow-dun colour, showing but little variation from that of their sire. This says much for the influence of the bull upon the progeny.

The Jura herd has been mentioned in connection with Mr Webster's stock. It is owned by Mr Campbell of Jura House, and the strain is held in great repute by West Highland breeders. High, if not fashionable prices, are paid both for sires and heifers for breeding purposes, the fame of the herd having gone abroad long ago. The pastures in Jura seem well adapted to the Highlander. The hills are covered with luxuriant heather, and the red deer and black cock share with the cattle the range of these open pastures. Here and there are well-wooded declivities and ravines overrun with bushwood, where the cattle can shelter during the occurrence of the western gales.

In the island of Colonsay, until a few years ago, a splendid herd of West Highlanders existed; but this has been dispersed. Several accounts of it have been published, giving interesting details of the superiority of the stock. Upwards of 40 years ago a bull was purchased from a fold of note in Rannoch, Perthshire, at the then high price of 120 guineas, which did much service in improving the existing strain. This herd was the property of Lord Colonsay, who evinced a deep interest in the breeding and management of his stock.

Mr John Stewart of Duntulm, in the Isle of Skye, owns a fold consisting of about 100 head, which are indeed difficult to rival. Most of the cattle are true types of the West Highlander, and seldom fail to come off in flying colours when entered for competition at the Highland Society's shows. Although well

cared for, they are by no means pampered. The in-calf cows alone are laid in during winter; the remainder run upon the rough pastures, and have a little hay given to them when a snowstorm occurs. For bulls of fine quality the Duntulm herd is celebrated, Mr Stewart upon one occasion having realised the large sum of L.250 for a magnificent animal. The Duntulm herd was descended principally from one of the finest folds ever seen in Scotland. This was the joint possession of Messrs Donald and Archd. Stewart, in the Isle of Harris, who spared neither pains nor expense to bring their stock to notable perfection. With this view they obtained animals from most of the ever-faithful districts upon the mainland, thus combining the bone and strength of the interior with the horn and hair of the islands. It is said that when their finely-moulded cattle, with hair like goats and horns like buffaloes, were being driven to the market at Falkirk, they were the theme of admiration in every district through which they passed. The stock is still well represented by that at Duntulm, which fairly lays claim to be the oldest in Skye. A moderately large herd is kept at Waternish in Skye, being the property of Captain M'Donald. He usually sells his surplus stock at Portree in May, for which there is a good demand.

In the small island of Barra Dr M'Gillivray owns a very promising herd, containing some nice specimens both of cows and heifers.

One of the largest folds in the county of Inverness-shire is at Balranald, in South Uist, the property of Mr M'Donald. This herd numbers from 90 to 100 cows in addition to the calves and young stock. The fold dates back about fifty years, and although it is generally admitted that the cattle are not large, yet the blood is pure, and the animals are altogether symmetrical and well-shaped. Of late years, fresh blood from the best Perthshire stocks has been introduced, so that in time the animals will doubtless attain heavier weights than they do at present.

In Mull and Jura also are to be found some nice cattle of the West Highland breed, but the herds are not so large as in some of the other islands and on the mainland.

It is generally conceded that there is a marked improvement in the cattle found upon the islands during the past twenty to thirty years, the infusion of fresh blood from the stronger animals of the mainland having given stamina to the weaker of the islands. With the exception of a few noted herds in Perth, Argyll, and Inverness, it is, however, a generally received opinion that the cattle of the mainland are slightly falling off, but this perhaps refers more to a decrease in point of numbers than to any deterioration in the cattle themselves.

Former System of Management.—Up to about forty or sixty years ago, very little attention was paid to the management of

stock. As the bulls and cows were never separated, the latter calved at all seasons of the year, and thus it often happened that great losses were sustained through the winter and spring months. These losses decimated the herds in a serious degree, but as there was not a very good "offgate" for young stock, little attention was paid to the circumstance; occasionally, in very stormy weather, a farmer might have been seen wending his way through three feet of snow, with a bit of coarse hay for his famishing stock, but the rule was, to let the animals cater for themselves. Of course, the aged cattle withstood the rigours of a severe winter better than the young ones, their coats being thicker, and as their systems were thoroughly developed, they were able to withstand greater privations in scarcity of food. In summer, it was, as it indeed still is, quite common to see the cattle ascend the high hills in fine weather, cropping the meagre herbage as they proceeded, but in the case of a storm they instinctively made for the valleys and lower grounds. In winter, sheer necessity forced them into straths and ravines, where they dragged out a miserable existence upon the rough grass which they found upon the meadows or in the wooded declivities that were so common at that day. Sometimes a kind of disease was brought on by exposure to cold and lack of proper nourishment, which now and then carried off a few animals; while not unfrequently scores of even the strongest cattle succumbed to actual hunger when the winters proved excessively severe. About a hundred years ago it is said that a farmer in the district of Rannoch, in Perthshire, lost over one hundred animals, all told, which no doubt might have been saved by the timely arrival of a supply of rough hay or oat straw. However, as prices, compared with present rates, were merely nominal, and rents easy to make up, very little was thought of the loss of a few animals during winter. In the spring of the year, the surviving remnants which had braved the elements, were as lean as wolves and as hungry as hackneys, their hair standing on end like "quills upon the fretful porcupine," their sides almost clapped together; the only visible improvement being in the length of the horn. Yet in April and May, when the lowland grasses began to spring, their progress was remarkable; and in about three months some of the better-class varieties were quite plump and fleshy, and, owing to the beef being all newly laid on, it was remarkable for its tenderness, juiciness, and general fine flavour. In course of time, farmers began to see the necessity of providing shelter for the cattle during the storms of winter. When a hurricane was seen to be approaching—and it may here be noticed *en passant* that a Highland farmer is generally pretty well skilled in weather prognostics—the cattle were driven into an enclosure under the shelter of a hill or wood, and there a scanty pittance of hay or straw meted

out to them, wherewith they might sustain life until the storm was over, when the animals were again allowed their liberty.

Present System of Management.—The present system of management varies very much in different districts, and with the size of the herds; indeed, in the same district, and under the same climatic and local influences, the modes of managing the cattle in winter are somewhat different. Some of the small herds in Argyll and Perth are divided into two sections, the breeding cows being placed in one fold and the young cattle in another. The latter are supplied with straw and a little meadow hay, and a few turnips when the crop is plentiful. The breeding cattle are somewhat more liberally treated, receiving a larger proportion of hay of superior quality, and more turnips. Other occupiers, chiefly on the more extensive holdings, prefer to allow the yearlings and two-year olds to roam at large in the fields, where they have a few turnips thrown out upon a piece of clean lea-ground, with a rack of hay or straw in an open shed at night. With this fare and the rough grass which they pick up in the woods, it is surprising how well they keep up their condition, a fact which at once stamps the hardy character of the race. At three years of age, the heifers are selected for breeding purposes, as it has been found that they are not mature enough at a younger period of their existence. In the winter and spring months, that is to say, in January, February, March, and April, the calves are dropped. Here may be noticed another diversity of opinion which exists. Some farmers keep the calves separated from the dams until the periodical turning out to grass, allowing them to be together for a short period three times a day; others keep them in a fold together, and although the latter system has many advantages, yet both the dam and her young become very wild, and almost unapproachable when allowed full liberty. In the beginning of October, the calves are weaned, and as the temperature at that season is generally low, the cows seldom suffer from sore udder, the milk having become almost dried up, on account of the failing pastures. It may here be remarked that some farmers of the present day give cake to the growing calves as well as to the cattle intended for the shambles. This ensures bone and rapid growth in the one case, and early maturity and a highly finished state in the other, but the plan can scarcely be called a judicious one in the case of calves which have afterwards to be turned upon the bleak moors, and there to subsist upon the scanty fare which nature has provided for them.

Several extensive graziers do not breed their own cattle, but purchase them when three or four years old, removing them to finer pastures in different parts of the country for the purpose of feeding. The following account of the management of West Highland bullocks was furnished by Laurence Dalgleish, Esq.,

on behalf of his brother John J. Dalgleish, Esq., and himself, the details of which will doubtless be found interesting. He says:—"We always, if possible, purchase privately, and not in a market, to save the risk of disease, though occasionally we have to purchase at Falkirk or Doune markets in October and November. The number wintered and fed off upon grass in each year varies from 150 to 200, and consists entirely of three or four-year old bullocks, costing from L.12 to L.14 for three-year olds, and from L.17 to L.18 for four-year olds. We never purchase heifers, as they do not come out with us the same as bullocks, while there is considerable risk of their turning out in calf. For nine years, we have purchased in one lot, and all from the same party, 100 four-year old bullocks, and in order to show the rise in price since we first got this lot, I may mention that in 1864 we paid L.12, 15s. per head; last year (1872), L.17, 15s. per head for 100; and this year (1873), the price for 140 was L.17. Such a prime lot is rarely to be got, and we pay more than actual value to secure it.

"Our system of management is:—We get the cattle home about the middle or end of October each year, and put them upon the pastures which have been grazed previously and left rough on purpose, allowing them to remain there until the 1st of March, when they are confined to one or two parks. Up to the date just named, the greater part of these cattle get no hay nor other feeding substance save what the pastures produce, except during a storm.

"On the 1st of January about 60 of the best, however, are selected, and are allowed a little hay daily, with 1½ to 2 lbs. of undecorticated cotton cake. From the 1st of March the whole of the herd get a full allowance of hay, and part of them cotton cake as before, until the 1st of May. Soon after this date the cattle are drawn or lotted for each park, the lots varying from thirty downwards, according to the size and richness of the pasture. There the cattle remain undisturbed or unchanged until the 1st of September. No dogs are allowed with the herdsmen, so that the cattle are as quiet as possible.

"After the cattle have been lotted for each park we generally give about 40 of the best of them an allowance of 2 lbs. of cotton cake up to July 15th, and then give these, and about 30 more, 3 to 4 lbs. of mixed cotton cake, linseed cake, and sometimes, for about one month before selling them, 5 lbs. of mixed cotton cake, linseed cake, and bean meal, in equal proportions. We occasionally give a much larger number of the cattle cake on the grass both in winter and summer, but this depends entirely upon the seasons, whether the cattle be lean or otherwise, and the pastures good or comparatively bare. We use nothing but undecorticated cotton cake, and the best home-made linseed

cake, while the hay used is bog or meadow, grown entirely on our own meadows. The greater portion of the cattle are never in a house winter or summer, while a few which chance to be near the onsteads have the use of sheds if they choose to enter, which they seldom do. We at one time tried the wintering of cattle in houses, but found that they were for the first three months so wild, and perspired so much, owing to their thick coats, that we lost more than we gained by such treatment, so that now we never think of keeping them in a house. We have plenty of natural shelter in our grazings, and the cattle are all so healthy and strong that they thrive much better when in a state of freedom. We seldom or never lose a beast except by a mishap, and out of about 200 we have had for the last twelve months we have only lost two, and those by accident.

"We generally keep these cattle for one year only, selling in September. The prices obtained range from L.17 to L.22 for three-year old beasts, and from L.23 to L.29 and L.30 for four-year old cattle; 100 of the cattle purchased in last year at L.17, brought this year an average of L.25, 17s. 6d., the respective prices being L.29 each for 33, L.25, 15s. for 11, L.25 for 7, L.24, 5s. for 22, L.23 for 25, and 2 were kept for showing, at say, L.32. As we purchase privately, so we sell to butchers in Edinburgh and the country surrounding the districts where the cattle are grazed.

"The cost of the year's keep of course varies very much according to the quantity of hay and cake consumed, but it will not be less than L.6 to L.7, so that taking into account interest on capital invested, and expense of management, there will be a very small margin left for profit, even in a year like this, when beef is so very high. We could, however, probably make more by purchasing coarser beasts, which would bring the same price per stone when fat as the finer-bred cattle, but the latter are more easily fed, and we like to see good animals, caring less for great profits than what will please the eye."

When and where Cattle are Sold.—The usual practice is to sell off all aged cows and surplus young stock at the end of the year. The former go off at 6 to 10 years, and the latter at about six quarters old. Higher prices might certainly be obtained in the spring, but the majority of feeders have little enough fodder to keep up the ordinary or stationary stock, without entailing additional expense in providing for those animals intended for sale. An exception is, however, made with respect to choice heifers, which in some of the districts are kept over until June, those from Argyll being usually consigned to Dumbarton for sale. In fact, the great markets for Highland cattle are Dumbarton, Falkirk, Doune, and Portree,

although now and then an anxious jobber or shrewd breeder thinks proper to send a lot to salesmen in Dumfries and other marts. Choice lots, too, are often picked up at home by graziers, who scour the most faithful districts in the autumn for the purpose of obtaining their usual supplies for winterage. The great staple of the Falkirk Tryst used to be cattle of the West Highland breed; but the extension of sheep husbandry within the past thirty or forty years has rendered the trade in the woolly tribe scarcely less important than that in grazing cattle. Every isle and holm, and every mainland glen at the time referred to, poured in its interesting droves, shaggy and black, or relieved only as to colour by a sprinkling of reds, and of duns, graduating from mouse to cream colour; and notwithstanding that the breeds and crosses exhibited at Falkirk were exceedingly various, the carefully-bred West Highlanders were still the flower of the show. They attracted every one's attention, and engaged every one's conversation; every individual beast was a delight to the eye of a *connoisscur*, and a study to the eye of an artist. What made the market more interesting to strangers was the fact that many of the cattle were brought to the tryst by their breeders, and it was not an uncommon sight to behold the neatly-formed stots and queys driven to the market-stance by a kilted laird from the Hebrides, whose language was to Lowlanders quite as curious as the dress he wore.

To speak generally, every one of these animals had its predestined course; the choicest of the duns, the creams, the reds and the brindles were bought up by agents to grace the parks of English nobles, where the great variety and contrast in colour had a grand and imposing appearance. Many dealers perferred the black type, as being more hardy, so that there was generally a sufficient demand for all colours. The young six-quarter was destined to clean up rough pastures and eat a little straw in Clydesdale, Dumfriesshire, Cumberland, and the neighbouring districts, and well it throve on such fare; the older of the small cattle were taken to Brough Hill in Westmoreland, a very important fair with dealers, because it was said to be attended by more gentlemen's bailiffs than any other in the United Kingdom; the finest West Highland heifers found their way into Yorkshire and the Vale of the Tees, where the shorthorn had its origin; and what steers were not required by graziers in the home districts of Argyll, Perth, Dumbarton, Ayr, and Fife, were usually consigned to Leicester, Northampton, and Buckingham.

In the bygone times alluded to, Joseph M. Richardson, Esq., land-steward to Sir Henry Ralph Vane, Bart., of Armathwaite Hall and Hutton Hall, annually bought a splendid drove in the

autumn months and brought them to the Cumberland estates. There they were allowed to run upon the rough pastures, and had a daily allowance of sweet meadow hay and turnips thrown upon the lea-rig. Their progress was most marked; they soon made prime fat, and there was great demand for them to grace the tables of the wealthy. But prices have gone up very materially within a few years, a circumstance it must be confessed which has had a serious tendency to prevent English buyers from entering into transactions so freely. The glory of Brough Hill, so far as Highlanders are concerned, has almost, if not entirely departed, and the shaggy coats have long ago disappeared from the margin of Bassenthwaite Lake. In the present autumn, (1873) the demand for Kyloes is very good, buyers being well represented at the various markets. Highland stirks make L.6, 10s. to L.8; two-year olds, L.10 to L.14; three and four-year olds, L.15 to L.19; and some choice animals, as far as L.21 and L.22. Before the extraordinary rise in the price of cattle, from L.10 to L.12 was thought a high figure for the choicest descriptions. In 1849 the rates were:—Stirks, L.3 to L.5, 10s.; two-year olds, L.7 to L.8; and three and four-year olds, L.9 to L.10, 10s. So much for the change in the times.

The West Highlander as a Milker.—Great diversity of opinion exists as to the milking properties of the West Highlanders. Some farmers aver that, as a rule, they do not yield a large amount of dairy produce, while others are quite sanguine in their belief that they excel as pail cattle. Of course, the circumstances under which the test is applied may have considerable influence either one way or the other. Notwithstanding their extreme hardihood, the roughness of their coat, and the length of horn which are characteristics quite opposed to those possessed by the pure-bred shorthorn, they have so many points in common with the breed alluded to, in the short legs, the level back, the symmetrical trunk, the broad chine, the expansive chest, the well-arched ribs and breadth of loin, that they can scarcely fail to produce a good supply of milk when properly treated. An eminent breeder says:—"In breeding for the dairy, the Kyloes have now the preference to every other breed. This superiority they have no doubt attained by judicious selection and breeding exclusively from such animals as secreted the most milk, as well as by persevering experimental observations. Good judges can now pretty accurately point out a profitable dairy cow from the development of certain points in her conformation." The Highlander is justly noted as a breed inclined to carry inside fat, and it is an established fact that the better the milking qualities of any breed, the more fat the animals are calculated to carry inside and *vice versa.*

The West Highland as a Breed for Crossing.—The crossing of

Highland heifers with shorthorns is a subject which is often discussed, but has probably never been thoroughly attended to; yet there is no doubt that by careful and judicious crossing, a useful race might be propagated, combining the early maturing, the fat forming, and the milking properties of the shorthorn, with the hardihood, the fine quality of flesh, and the noble appearance of the West Highlander. Where crossing has been tried, it has often been done injudiciously, with animals far too young; thus the offspring would be quite diminutive. But were fine three-year olds from some of the herds already named, crossed with sires like "Ignoramus" or "Edgar," there is no doubt that a race of cattle would be produced, as the auctioneers say, "fit for anything"—breeding, feeding, or dairy, and calculated to withstand the vicissitudes of almost any climate. Occasionally an English breeder buys a pure-bred Highland heifer, which is crossed with a shorthorn bull, the offspring being again crossed with a shorthorn, and the progeny are not only splendid milkers, but very quick growers, and are everywhere favourites with the butchers when fat. Crossing the Highlander with other breeds than the shorthorn has been tried with a certain amount of success in some instances, but it has been generally found that no cross produces such satisfactory results as that with the shorthorn, as the two breeds have so many points in common, and others so widely different, that mixing the blood seems to inculcate qualities in the offspring, wanting in both of the breeds from which they are descended.

Improvement and Conservation of the Breed.—Much has been done in late years with the view of improving the West Highlander, as evidenced by the fine animals which sometimes grace our Christmas and other shows. This improvement is particularly noticeable in the Western Islands, where strength of bone has been combined with hair and horn, while in some of the mainland herds there has been wonderful improvement. Much more, however, might still be done, both in the improvement and conservation of this valuable breed. A few years ago sheep farming encroached so much upon the districts in which the cattle are reared, that it was feared that the shaggy-coated Highlanders would become almost extinct; and had prices not become very much higher, there would have been good reason for being alarmed, but from the very fact of the comparative scarcity and the great competition throughout both Great Britain and Ireland for cattle for feeding purposes, in order to supply the increasing demands of the meat-eating population, value was enhanced so rapidly, that breeders were encouraged to pay more attention to raising bovine stock for the market.

It is a matter of some difficulty to lay down rules for the improvement of the West Highlander, inasmuch as it is the creature

of a certain locality, which is bleak, wild, and barren, and in which most other breeds, if exposed to the privations the West Highlander has to endure, would succumb. Therefore, any treatment tending to pamper the breed would to a certain extent destroy its usefulness. The more artificial influences that are brought to bear on the feeding and management of any animal, the more tender will such animal become. Still, there is a difference between pampering and actually starving—a difference which should be borne in mind by those who have the management of hardy animals. Severe privation tends to disease; this should be carefully guarded against by the breeder of West Highlanders. The winter quarters ought to be sheltered either by natural ravines and declivities; or belts of plantations may be reared where natural means of shelter do not exist. Housing has been tried, but the system has been found wanting, as beasts which have their liberty invariably turn out better in the spring, that is, if their pasture has afforded sufficient shelter from heavy storms.

When winter snows occur, hay or even straw should be liberally supplied, for it is at such times that the animals need the support their own "niggard plains deny." It is an indisputable fact that animals need more food in *extremely* cold than in *moderately* cold weather, as the quantity of feeding substances necessary to keep an animal in a healthy progressive state is usually proportionate to the degree of cold which has to be endured. The breeder of stock should therefore make himself thoroughly acquainted with the descriptions of food best calculated to attain the object in view, and these should be meted out at the exact time when they are needed.

In-and-in-breeding should be at all times avoided, for it is the opinion of many experienced breeders that it is detrimental to the stock, as deterioration soon sets in, and the progeny of blood-related parents become stunted and dwarfish. The infusion of fresh blood from herds of repute has quite an opposite tendency, and where this is judiciously effected the results are marvellous.

Where improvement guides the actions of the breeder, it is quite evident that conservation will naturally follow; for the interest which he has in his stock will cause him to keep up the numbers. Moreover, although sheep-breeding has for years been encroaching upon the native heaths of the West Highlander, there is a limit even to this, and it is the general opinion that the level has at length been attained. There is a brisk demand for cattle for grazing purposes, and West Highlanders must ever be held in the foremost rank. Their flesh is of the sweetest, and there is a freedom from disease in the whole race which causes the beef they produce to be sought after by epicures and those who understand the influence which pampering has upon the

flesh of fattening animals. In furtherance of the improvement and conservation of this hardy and picturesque race, it may be noted that there are certain external signs which may serve to guide the breeder in selecting animals calculated to produce healthy offspring capable of early maturity. The touch is known by the thick loose skin, which yields to the least pressure like a piece of thick chamois leather. This indicates hardiness of constitution and capability of carrying plenty of muscle as well as a sufficiency of fat, and also of withstanding the rigours of a cold climate. The ears should be tolerably fine, thick ears being a sign of coarseness. The horns also ought to be fine, without, however, sacrificing either length or strength, coarse and thick horns indicating ill-bred animals. The eye should be bright and lively, and the muzzle well defined.

Concluding Remarks.—In bringing this report to a close, it may be well to reproduce the most prominent points requiring attention in the improvement and conservation of the West Highland breed.

1. Attention should be paid to secure the best blood whereon to found a stock.
2. Each fold should from time to time be improved, or rather kept up to a certain standard of excellence by the owner selecting fresh strains of blood from herds of repute.
3. In the rearing of calves, the young should be generously treated, and have free access to their dams, in order that they may obtain sufficient nourishment to ensure the development of bone, frame, and muscle.
4. Good shelter should be provided for the stock in winter, thus preventing disease, and the younger animals from becoming stunted in growth.
5. During the winter storms food should be supplied, conducing to heat and general healthiness of condition.

So long as the present standard of perfection is kept up in the noble breed under consideration, and beef remains at a high price, there is no fear that the farmers in the West of Scotland will allow the numbers to fall off seriously, for so long will both the breeder and rearer be amply remunerated for their outlay.

NOTE BY THE EDITOR.

In an article published in the "Transactions of the Highland Society for 1803," there is a paper on the state of the Highland cattle during winter. In that paper great stress is laid on the losses sustained by the death of cattle in the spring season from want of food and the diseases that are engendered by starvation.

It is stated that in summer they are sufficiently fed, but that in winter they have nothing to support them but the decayed gleanings of the herbage of the former summer. In many districts of Scotland it is feared the same treatment still continues, and that in the spring time the cattle are so poor that they fall victims to the anthrax fevers which are unfortunately now so prevalent. I have thought it might be useful to draw attention to a suggestion in the paper above alluded to, as I have for many years adopted it, and have found it to be most beneficial to my stock.

On all hill farms there is a considerable extent of rough *Rashic* grass such as deer's hair, bents, spret, &c., which neither cattle nor sheep will eat in summer or autumn, and which yearly is killed by the frost. Great quantities of hay might be made from this grass, which, though coarse in quality, if slightly heated, like English hay, will be greedily eaten by cattle in winter; and though not affording sufficient sustenance to fatten the animals, will keep them in a healthy growing state, and prevent that great mortality in spring which so frequently happens from starvation and weakness. The plants from which this hay would be made decay and fall upon the ground in winter, and in this decayed state are the support of many herds of cattle. It cannot, therefore, be doubted that if made into hay in August and September, when fresh and succulent, they will afford a supply of most useful provender in winter. This hay should be preserved for use till the month of January, unless snow covers the ground, when it should be at once had recourse to, so as to prevent a starve. Highland cattle with their thick winter coat and hide can stand out a great amount of storm and cold, if they have sufficient nourishment to prevent actual starvation.

Hay on many farms is cut only on the very best of the grass, and that perhaps all given to the breeding cows, and the other cattle left to shift for themselves as they best can; whereas if a little more labour was bestowed in turning some of the coarse grass into hay, the cattle would be in better condition in spring, and perhaps more stock might be kept on the farm.

Some farmers object to cutting this coarse grass, thinking it useful food in its decayed state early in spring, when the fresh growth begins to come up amongst it. It has been found, however, that when eaten by sheep in this state it is very indigestible, and if taken in any quantity, forms into small hard balls in the stomach, very frequently resulting in death.

ON INOCULATION AS A MEANS FOR THE PREVENTION OF PLEURO-PNEUMONIA.

By George Armatage, The Bank, Hertford.

[*Premium—Ten Sovereigns.*]

The result of continued observation in reference to the prevalence of contagious diseases, more especially those reputed to be of foreign origin, is the now almost universally acknowledged conviction that they have a ruinous tendency, first by the pecuniary losses they entail, and secondly, by the rapid decimation of an unequalled breed of horned cattle and sheep.

Another and no less important conclusion has been furnished by the experience so dearly purchased since 1842, which is the fact that, in a medical point of view, nothing of curative value is yet known either in this or in other countries, therefore such plagues still march on with irresistible force, giving rise to an innumerable train of evils.

The nation has had abundant opportunity for testing the usual characteristics of these maladies, and it is now more calmly waiting the adoption of suitable preventive means, which at first were generally considered to be useless or impossible. Ranking foremost among foreign plagues is pleuro-pneumonia, and as one of the principles for reducing its serious effects, inoculation has been proposed, which we shall proceed to discuss in the following pages.

Method of Performing the Operation.—The tail is selected as the most suitable part, and "the virus" is introduced as near the point as possible, for, in accordance with sound judgment, as well as from practical experience, adverse results do not prove so unmanageable in that locality. This will be referred to hereafter. The animal is first secured in the usual manner, and the operator seizes the tail by the tuft in his left hand, holding in his right a needle or bistoury (knife), which has been first plunged into the substance of a lung diseased from *pleuro-pneumonia exudativa*. With this he pierces the skin, making only a simple puncture, which for all practical purposes is found sufficient. This was the plan originally employed by the promoters of the operation, but others have likewise been adopted, which we proceed to describe. A portion of the deceased lung being cut from the organ, is secured to the tail by ligature or bandage, immediately over an incision which was previously made with a knife. The third, and certainly the most cleanly and scientific method, consists of passing beneath the skin of the tail a drop or two of the fluid or serum obtained from a diseased lung, by means of a syringe, armed with a hollow delivery tube, formed and pointed like a needle. The first of these methods was practised and

recommended by Dr Willems of Hasselt, who first suggested the procedure; the second is the rude plan usually adopted by dairymen; and the last is preferred by the veterinarians of Great Britain for the various advantages of facility, efficiency, cleanliness, and general safety above the others.

The *selection of the tail* near the point, as a suitable part for the operation, in practice has proved to be a wise one, and for this reason:—At this point there is little substance to be involved in the inflammatory process, and if sloughing or gangrene follows, there is less likelihood of serious disturbance of the system from the absorption of the results of those morbid processes. The loss of the lower portion of the tail is not of much consequence, so long as the animals are rescued from a fatal malady, and thus the locality has special advantages over all others which may be selected. Some practitioners inoculated animals in the dew-lap, fore-arm, &c., but the results were generally such as forbid the practice. On this point Dr Willems says:—

"Many persons think that inoculation for peripneumonia is more conveniently practised in the dew-lap than in the tail, but such persons are solely guided by theoretic views and not by experience. For instance, M. Mavis, V.S. of the Government of Hasselt, desirous of modifying my method of procedure, inoculated about thirty beasts in the dew-lap, and this is the result. At the commencement of August sixteen beasts were inoculated in the dew-lap, belonging to M. Claes; twelve of them fell victims to the consequences of the operations. At M. Mavis' brewery at Hasselt, two cows were inoculated in the dew-lap; both died. At M. Ant. Vinkerbosch's two oxen were inoculated in the dew-lap, and they likewise both shared the same fate about fifteen days subsequent to the operation. Thus, through bad inoculation, have many beasts been killed outright."*

The experience of Australian experimenters is conflicting.† After inoculating in the tail, and finding that organ implicated with surrounding parts in general tumefaction, the reporters concluded it was not the proper part. "Others," say they, "we inoculated in the fore-arm; we took a piece of tow and saturated it in the matter obtained from the diseased lung," and this procedure was based on the conclusion of one of the body, who adds—"I reasoned in my own mind that the tail was not the most suitable place, for there was no muscle to form a suppurating cyst, so as to throw off any excess of virus, or any quantity of deleterious matter that might collect there—that part of the tail near the point being composed principally of skin, blood-vessels, nerves, and bones. All those cases where inoculation was performed in the fore-arm went on favourably, the wound suppur-

* Rec. Med. Vet.

† Report to Commissioners of New South Wales, 1862.

ated and cast off the tow and excess of virus, and ended favourably. Those that were inoculated in the tail were weak in the lumbar region, and had to be assisted to rise; none that were inoculated in the fore-arm suffered in that way."

Those who have had recourse to inoculation in Great Britain are unanimous in their selection of the tail, and entirely on account of the less formidable results. The conclusions of Willems have been ratified in this country, and our personal experience entirely agrees with them. The swelling from the operation we have invariably found sufficiently serious and extensive; the nearer we approach the soft parts the greater danger has been apprehended. Continental veterinarians favourable to inoculation also agree in the sole performance of the operation near the point of the tail. Professor Gamgee says:—"If operated severely, and higher up, great exudation occurs, which spreads upwards, invades the areolar tissue round the rectum and other pelvic organs, and death soon puts an end to the animal's excruciating sufferings."

Selection of the Proper Virus.—We have adopted the following plan, which we believe is the one usually made use of by practitioners. An animal is selected which is in the early stages of a mild form of contagious pleuro-pneumonia, and slaughtered, and a portion of the lung is taken, and after being incised in several directions, is placed upon a strainer within a suitable bowl or basin of stone, glass, or earthenware, and covered with flannel or cloth sufficiently to preserve warmth and freedom from dust and foreign matters. A clear yellow fluid exudes from the diseased tissue, and this constitutes the fluid used for inoculation from the supposed existence of the so-called "virus" of contagious pleuro-pneumonia. When it is necessary to preserve this fluid for future inoculation, glass tubes are made use of, being three or four inches long, about three-eighths of an inch in diameter, both ends of which are sealed in the blow-pipe. All parts of the lung are not suitable, only those in mild stages of disease are to be made use of, which are known by their being distended by the fluid referred to. Parts in advanced stages, such as hepatization or becoming gangrenous, must be avoided, for the most baneful effects follow their use, and set aside the usually acknowledged results of proper inoculation. Care is likewise required in making the necessary puncture or incision, as untoward results equally follow such that are made with blunt instruments, and when they pierce the bones, are made to create useless irritation.

Effects on the System.—Professor Gamgee thus sums up the results of inoculation:—"If the operation be properly performed with lymph that is not putrid, and the incisions are not made too deep, the results of the operation are limited to local exudation

and swelling, general symptoms of fever, and gradual recovery. The most common occurrence is sloughing of the tail." Dr Willems, before referred to, arrived at the following conclusions from his investigations:—

"1. Pleuro-pneumonia is not contagious by inoculation of the blood, or other matters taken from diseased animals, and placed on healthy ones.

"2. That the blood and the serous and frothy liquid squeezed from the lungs of a diseased animal in the first stage of pleuro-pneumonia, are the most suitable matter for inoculation.

"3. The inoculation of the virus takes from ten days to a month before it manifests itself by symptoms.

"4. The matter employed for the inoculation has, in general, no effect upon an animal previously inoculated, or having had the disease.

"5. The inoculated animal braves the epizoötic influences with impunity, and fattens better and more rapidly than those in the same atmosphere with it that have not been inoculated.

"6. That inoculation should be performed with prudence and circumspection, upon lean animals in preference; and towards the tenth day after the operation a saline purge may be given, and repeated if necessary.

"7. By inoculating pleuro-pneumonia a new disease is produced; the affection of the lungs, with all its peculiar characters, is localized in some parts of the exterior, but whether it occasions apparent morbid manifestations or not, the inoculated animal is preserved from pleuro-pneumonia.

"8. The virus is of a specific nature; it does not always act as a virus. The bovine race alone is affected by its inoculation, since other animals of different races, inoculated in the same manner and with the same liquid, experience no ill effects."

Professor Williams, in his excellent treatise recently published,* says:—"In the most favourable instances, a slight heat and swelling occurs round the inoculated spot in a period varying from a week to two months; generally, however, the eruption manifests itself from the 9th to the 16th day, accompanied by slight rigors, loss of appetite, and slightly diminished secretion of milk. When the operation has been properly performed, and the virus carefully selected, the effects are generally as above described, but when the virus is putrid or badly selected, or, as sometimes happens, some peculiarity exists in the inoculated animal, the primary swelling is excessive, the tip of the tail becomes gangrenous, the animal suffers from a high state of fever; secondary deposits occur at the root of the tail, around the anus, and in the abdominal glands, and death occurs in a few days after the inoculation."

* The Principles and Practice of Veterinary Medicine, p. 153

Considerable stress has been laid upon the manner of performing the operation, to which in many instances, no doubt, the so-called effects of inoculation may be falsely ascribed. For all practical purposes a simple puncture or incision of the skin is amply sufficient to ensure the absorption of "the virus," and, if it be a "virus," for the production of all the characteristic phenomena which are manifest of the actual production and presence of *the* disease, but in a milder and more manageable form, from which future immunity is to be obtained. But up to the present time it remains a debateable and unsettled point whether the appearances or results of the inoculation are not in many cases more dependent on the violence used, the instrument wounding bones and ligaments, &c., or being charged with matter from putrid sources. The Continental authorities on inoculation for pleuro-pneumonia maintain that the disease is actually produced within the system by "the virus," *but it is localised,* a circumstance *entirely arising from the artificial method employed,* and to this localisation of the malady the success of inoculation is due; moreover, they likewise state that "no constitutional effects can result from inoculation unless local morbid action is first produced," statements which are not verified by experience. Professor Simonds found animals to resist the action of "the virus," if the absence of local signs are to be received as proof, and likewise to resist the disease itself, although such animals remained with the diseased and dying. Such is also our own experience, and conversely, animals previously inoculated, and in whom all the local signs have been fully and satisfactorily established, have contracted pleuro-pneumonia as though such operation had not been performed.

These phenomena, which have repeatedly occurred, and are well known to Continental and British veterinarians, have given rise to a well-established doubt respecting the nature and constitution of the fluid expressed from the lungs. Is it a "virus?" As the term stands and is used in medicine, it simply means a morbid poison, the product of a disease, and capable of producing the same disease in another animal of the same species at least, by inoculation or insertion beneath the skin. How different, however, are the results of the use of the so-called "virus" of pleuro-pneumonia? It is admitted by the original promoters that in no case does disease of the lungs, or, in other words, the real and intrinsic signs of pleuro-pneumonia ever appear after inoculation, except as a result of pyæmia or blood-poisoning. Nevertheless, the disease, to all intents and purposes, is located in the local tumefactions. The statement sets up a new theory in the science and practice of medicine. Hitherto it has been sufficiently relied upon that each "virus," no matter how it is introduced to the system, so long as it obtains an entrance to the circulating fluid,

the blood, travels to its own particular seat, and there, in its ravages, produces all the acknowledged signs. Thus, for instance, the special poison or virus of rabies produces rabies; that of glanders, gives rise to glanders; and the same law prevails with respect to small-pox, farcy, cow-pox, and others which are known as contagious, and are propagated only by means of the morbid products of the disease. It does not, however, appear that pleuro-pneumonia spreads itself by these means so much as by and through the medium of the atmosphere, the poisonous products being evolved from diseased animals and carried by the air in an invisible and imponderable form, constituting the process known as infection. All the experiments hitherto made distinctly show that the introduction of blood, serum, &c., of diseased animals to healthy ones gives rise to a septic or putrid blood-poisoning, and in this particular, pleuro-pneumonia resembles other diseases, as strangles in the horse, and some of the various forms of anthrax fevers—the original disease never being produced by inoculation.

Dr Willems laid some stress on the preservative influence of the inoculation, and gives instances of animals remaining alive and well although they continued to be located with diseased and dying cattle; while in his own town of Hasselt, where no less than 2000 animals are fed, during the extreme prevalence of the pest in 1852, the cattle of several of the large distillers entirely escaped on which *no* inoculation had been performed. This has been the oft-repeated experience of those who have since given the matter consideration, and the only plea that can be advanced in support of the theory is that of the so-called "virus" acting as a derivative, or more simply, just as a blister or seton, by diverting the course of the ailment; and the last portion, likewise unexplained to the present moment, is the uncertainty of the time over which the prophylactic influence spreads, a question which is rendered more and more profound by the conflicting evidence which is being daily produced. Inoculated animals have resisted the disease up to various periods. We have witnessed attacks of veritable pleuro-pneumonia within ten days after the operation, and also at different times up to a year or thereabouts, and at the same time herds of cattle, contiguous or at a distance, have exhibited exactly the same phenomena although no inoculation had been practised, and some have remained free altogether.

Dr Willems, besides contending that no failures occur with him, asserted that there is no susceptibility to a second inoculation in those previously inoculated, but on this point no reliance can be placed. Professor Simonds* demonstrated what has since been proved hundreds of times in the dairies of Great Britain, that

* Second Report to the Royal Agricultural Society, June 1, 1853.

re-inoculated animals *do* exhibit all the signs of fever, tumefaction, &c., as those only once operated upon; others also resisting it just as they resist it the first time.

It remains for us to notice another important proposition set forth by Willems, viz., the transmission of the "virus" from one animal to another by what is technically known as "removes," from the first source of the disease. The practice was established in imitation of vaccination, by which the lymph of the disease is caused to become milder, safer, and equally efficacious as the original virus. The promoter states that he has carried the virus through five removes, and with the satisfactory results that *no* deaths and *fewer* casualties have arisen, but he adds, in unconscious contradiction, that he prefers the original serous exudations from the diseased lungs.*

Dr Willems maintains that a special corpuscle, having a tremulous motion, is developed in the products of pleuro-pneumonia, and that this constitutes the means by which the disease is communicated. Professor Simonds † informs us that he examined morbid products with Dr Willems, at Hasselt, using the same microscope, but failed to discover anything but the ordinary proceeds of inflammation. The assertion, it is necessary to state, is at this moment as far from confirmation as when first uttered.

Notwithstanding that a great deal of information has been gained in reference to the question of inoculation for pleuro-pneumonia, and that since 1852 the various countries of the world have taken up the inquiry, and experiments have been performed upon many thousands of animals, the great question of the efficacy of the proceeding is but very imperfectly understood. It is likewise well known that hundreds of British dairymen, we may say the major portion, have regularly inoculated their cattle, yet we are no nearer the extermination of the dreadful scourge. A cynical writer in "The Farmer" ‡ says, in quoting from Mr Bruce's report to the Government of New South Wales, that eighteen out of twenty persons there are in favour of it, yet "Here veterinary science—falsely so-called—stops the way of even a public experiment on a small scale. It will be time soon for us to educate our masters." We fail to see how veterinary science has put a stop to the trial of inoculation for pleuro-pneumonia, for if eighteen out of twenty in New South Wales are satisfied with their experiments, and so many dairymen here still continue to go on with it, it appears they have it very much their own way, and we look to these men to inform us what they have done in the way of mitigation. Newspaper paragraphists have had too much say on the matter, and have too freely expressed opinions on this and kindred subjects of

* Professor Simonds, opt. cit. † Ibid.

‡ August 16, 1875.

which they knew but little, greatly to the detriment of the cause of plague extermination. All that such writers have done has been to help the proof that pleuro-pneumonia still rages fearfully, and with all the inoculation practised by 90 per cent. of cattle proprietors, representing probably also 90 per cent. of the cattle of their respective countries, we are told the proceeding exerts such a powerful preservative influence that it should become compulsory. All we can say is, we must have more than such statements furnished before we can see the results so exultingly expressed. With such preservative influence, why, in the name of common-sense, are we not at least almost clear from the scourge? If it is so, importation of cattle need not be controlled; no matter how many fresh animals are brought over, they cannot infect ours; if they are preserved by inoculation,—they are preserved we take it. But facts prove the contrary. As an importing nation, it may be argued, we stand in a very awkward position, and the results are not so perfect as could be wished. But still we are wanting proof. Australia is by no means an importing nation, yet for 20 years she has practised inoculation, and at this time suffers so acutely that she is asked to make it compulsory. Surely if 90 per cent. of the owners are not sufficient to convince the remaining 10, their experiments and proofs are not of a very conclusive character.

It remains now for us to notice the various conclusions that have been arrived at by those who have tested the theory of inoculation, and in doing so, it will be impossible to reproduce the whole of the voluminous matter which has been published; we will, however, give the most useful particulars, referring the reader to the original sources for further details.

Dr Willems, although the first to publish his conclusions, which have already been given in full, was not the first to practice inoculation. M. Désaive performed the operation in 1836, and following him we are informed,* were Dieterichs and Vix, but their experiments yielded no satisfactory results. Willems commenced inoculation in 1850, on cattle belonging to his father, having been altogether unsuccessful in otherwise treating the disease, and in September 1852 he called the attention of the Belgian government to the subject, which had the effect of rousing other countries to an examination of the theory. After an impartial observation of Willems' method, they returned the following summary of conclusions :—

"That inoculation with liquid extracted from a hepatised lung, the result of exudative pleuro-pneumonia, is not a certain preservative against the malady. That the phenonema succeeding inoculation may be produced several times in the same animal, which may, and may not, have been attacked with

* Williams *op cit.*

exudative pleuro-pneumonia. That the two affections may exist together in the same individual, and that considerable derangements are manifested in the inoculated part, whilst the morbid action of the lungs progresses towards a fatal termination. As to the ascertaining whether inoculation really possesses a preservative power, and if so, in what proportion, and for what length of time it imparts immunity to the animals subjected to it, these are questions which can only be solved by further experience.

"Read and approved at a meeting of the commission. Present—

M. Verhezeu, *President.*

Bellefroid. Deuterluigne. } *Members.*
Gluge. Sauveur. }
Theis. Thiernesse. }

Fallot. } *Delegates from the Royal*
Marinus. } *Academy of Medicine.*

"Brussels, *6th February* 1853."

Prior to the issue of this report Dr Willems had addressed the Central Society of France, and the memoir was given in extenso in the "Réceuil de Méd Vét," the editor of which adds :—"That notwithstanding, the facts published in it have need of vigour and precision ; that the conclusions adduced from them have the appearance of being rather hasty, and not sufficiently indicated by their premises."

The Dutch commission issued two reports on 21st September and 28th December 1852 respectively, their conclusions being drawn up in no less than 13 somewhat lengthy propositions. The only important ones calling for notice are the 11th, 12th, and 13th. Referring to the commencement of the disease after inoculation, it is "ascribed to its having been in existence at the time of inoculation."

Paragraph 12 asserts that in animals having had the disease, inoculation remains inoperative, and they rarely, if ever, become affected a second time. This contends for a preservative influence conferred by the disease, which is a contradiction to the preceding paragraph. If the real disease is produced by inoculation, as asserted, although localised, it should suffer mitigation and localisation if already present within the system, while at the same time it affords no limit as to the incubative stage of the disease.

In paragraph 13 we are informed "that inoculation possesses the power, at least temporarily, to prevent infection, [but] it remains uncertain how far disposition for the disease is completely, or only for a longer period, destroyed." Here we are informed the preservative influence of the disease is only temporary, a decided contradiction of the 11th paragraph ; and

it concludes :—"From the nature of the subject a considerable time must elapse before any positive conclusion can be acquired on this point."

In 1852 Dr Ulrich was commissioned by his government to go to Cologne, and into Belgium, in order to make observations on the subject of inoculation for pleuro-pneumonia. He was in communication with Dr Désaive, inoculator for the district of Cologne, and M. Sticker, who was employed at the same time and places by the Prussian government, and for the identical purposes ; he had likewise the advantage of communications with Dr Willems of Hasselt, and M. Verhezen, Director of the Royal Veterinary School at Brussels. His conclusions are as follow :—

"1. It is an established fact that, in many stables wherein pleuro-pneumonia had raged for several years, as well as in others which had only been infected by it of late, the disease disappeared shortly after inoculation. That, on the other hand, cases have occurred in which the disease has continued to rage after, and in spite of, inoculation.

"2. In many cases of beasts dying afterwards of the disease, inoculation has not proved successful. At the same time there exist examples of the contrary ; animals in whom inoculation has quite succeeded, and yet for all that, they have become afterwards the subjects of the disease.

"3. Cases have occurred wherein inoculation has proved without effect on beasts already in a state of convalescence from the disease. And others have occurred wherein inoculation has proved equally successful, notwithstanding the subjects were convalescent. Others again have presented themselves wherein inoculation has failed to take any effect on beasts, either before or after this operation. The assertion of Dr Willems, that inoculation takes no effect on calves, is not borne out by experience, since several calves have died after inoculation.

"4. In many cases wherein inoculation had been practised on cattle recently purchased, and put into stables formerly infected but since purified, no fresh case of the disease has presented itself for three months after occupation.

"5. No instance has come to our knowledge wherein inoculated animals placed in purified stables have become infected. Nevertheless, a member of the Agricultural Association of Dusseldorf has assured the members at a recent sitting, that inoculations made at Rheinberg had been attended with the results of propagating pleuro-pneumonia, which before was in that situation unknown.

"6. In some isolated instances, animals not inoculated standing by the side of others in the same stable, which were infected, caught the disease ; while others which had been inoculated were preserved from taking it.

"7. Of 204 beasts inoculated by Dr Désaive, 13 died of inoculation—viz., 6 per cent; while in Belgium, of 189 inoculations made by the central commission, only 3 died—viz., 1 or $1\frac{1}{2}$ per cent. Of 1400 beasts Dr Willems pretended to have inoculated, 12 died, less than 1 per cent. Of 1200 inoculations made by M. Manis, 22 deaths have followed, nearly 2 per cent. In the majority of cases death ensued about the third or fourth week, though in some instances not until two months after inoculation.

"8. Of the 191 head of cattle inoculated and cured by Dr Désaive, about 30 have lost the whole or part of their tails. No calculation has yet been made as to the proportion that have suffered in this way in Belgium; nevertheless it has been ascertained, in certain numbers of cases, that the loss of the tail has been in the ratio of 3 out of 11; 10 out of 22; 12 out of 50; 13 out of 51; and in one case, even all of 13 inoculated. Complete recovery has been generally tardy and difficult with many animals, occupying two months and a half, and even three months.

"9. The assertion of Dr Willems that the beasts which had been inoculated fattened more readily, and furnished more milk than others who had not undergone inoculation, appears to be confirmed by some distillers at Hasselt.

"10. Four calves inoculated by the Belgian commission fell victims to the articular synovitis of calves, after inoculation; and the inoculation of a cow at the school at Brussels, was followed by the eruption of a dartrous affection of an extensive character. Dr Ulrich makes mention of these facts by way of record, without considering them absolute sequelæ of inoculation. These various results springing from inoculation, which have come to the knowledge of M. Ulrich, do not appear to be of a nature to permit him to pronounce definitely on the value of inoculation for pleuro-pneumonia, since by the side of facts in favour of it, come others militating against it, and especially since it has not yet been demonstratively shown that beasts inoculated and exposed to the natural contagion for a space of time, of sufficient and satisfactory length, have remained uncontaminated. To prove this some direct experiments must be instituted. Afterwards, Dr Ulrich informs us that the Belgic commission have already entered on the undertaking; and to settle the point, have instituted a series of direct experiments, while similar experiments are about being made in Holland and in France. In France, he says, a committee well qualified for it have taken up the question anew of the contagion of pleuro-pneumonia, since even up to this day its contagious property has been questioned in France, though fresh experiments have convinced them of it. In regard to M. Willems' opinion

about a beast which has once had the disease not being able to take it again, M. Ulrich thinks differently; and his opinion is partaken by M. Verhezen. M. Ulrich adds that the well authenticated facts of beasts having had the disease a second, and even a third time, are so numerous that we must consider before we regard them as exceptional instances." *

We now come to the French Report which appeared in 1854. The Commission, consisted of the most eminent medical and veterinary authorities of the kingdom, including Majendie, president; Reynal, secretary; with Bouley and Delafond of the Alfort Veterinary College; Yvart, inspector-general of the imperial veterinary schools; Renault, Inspector of imperial veterinary schools; Rayer, a celebrated pathologist; with others whose names and positions secured their eligibility for such an important task. The question before them was the contagious property of the disease; its transmission by cohabitation; power of resistance of the animal body; susceptibility of the ox species; immunity from secondary attacks, &c.

A number of animals were handed over to the Commission, and the results drawn from their experiments, which were conducted in the most clever and scrupulous manner, were embodied in the following terms :—

"*Firstly,*—The epizoötic pleuro-pneumonia is susceptible of being transmitted from diseased to healthy animals by cohabitation.

"*Secondly,*—All the animals exposed do not take the disease —some suffer slightly, and others not at all.

"*Thirdly,*—Of the affected animals some recover and others die.

"*Fourthly,*—The animals, whether slightly or severely affected, possess an immunity from subsequent attacks."

The Commission likewise entered into a rigid examination of the practice and effects of inoculation. The subjoined are their conclusions :—

"1. The inoculation of healthy animals of the bovine species with fluid obtained from the lungs of one affected with pleuro-pneumonia does not transmit the same disease.

"2. The appreciable signs following inoculation are those of local inflammation, usually of light and simple character; but in some cases it assumes a grave and diffuse nature, united with gangrenous states and complication of organs, from which some die. In 61 animals out of 100 the operation was benignant; in 38 excessive tumefactions arose, accompanied with gangrene, and of these 11 died. Of the whole number, 88 recovered, 61 presenting no trace of the operation, the remaining 27

* Réc. de Méd. Vét., April 1853.

exhibiting various deformities, from loss of tissue or whole parts, &c.

"3. The practice of inoculation appears to reduce the susceptibility of animals to the contagion of pleuro-pneumonia; but for how long has not been positively determined. The longest known period is six months. In order to understand more clearly the absolute value of inoculation as a means of preserving bovine animals from attacks of pleuro-pneumonia, it will be useful to compare the results with those obtained by careful observations on the transmission of disease by cohabitation. Of 100 animals exposed to contagious influences, 32·61 were unaffected, and 21·73 became mildly affected. In other 45·65 animals the disease was more or less intense, 35·95 recovered, and 8·69 succumbed to the consequences of the disease. In 100 inoculated animals, 61·11 showed the mildest effects, and 38·88 suffered in an aggravated degree. Of the 38·88 sufferers, 27·77 recovered, after exhibiting intense local and constitutional signs, gangrene, &c., and 11·11 died from those effects.

"The first important truth which is gained by these investigations is, that inoculation causes greater mortality than that which results from the disease for which it is brought forward as a prophylactic. In addition, the animals recovered from the gangrenous forms have lost much of their commercial value by reason of the unsightly deformities which they have contracted; while, on the contrary, those which contracted the disease in the usual way recovered their value, as well as aptitude for milking or fattening. Notwithstanding, it is only right to say that the greater number of animals which recovered from pleuro-pneumonia, contracted after inoculation, did not recover from the disease resulting from it. In the majority of cases investigated by the Commission, the *post mortem* appearances disclosed portions of the lungs to be undergoing degeneration (*véritable mortification*). A circumscribed mass of tissue is involved in gangrenous disease, surrounded by healthy substance, and the former interferes with the function of respiration and purification of the blood to such an extent as to preclude the animal from use as a milker or feeder."

The Commission closes its remarks by adding, that although the results of the experiments that have been instituted point strongly to the excess of mortality from inoculation, the freedom of the animals employed may be traced to their being brought from the country, and so less liable to the deteriorating influences of close sheds, &c., which are well known to produce greater susceptibility to diseases of all kinds. They likewise state that, while it does not appear from their experiments that inoculation is an advantageous proceeding, it is nevertheless shown to possess a preservative power, and they are of the opinion that the prac-

tice may in process of time be encouraged by the addition of further knowledge on the subject.—"Rapport Général des Travaux de la Commission Scientifique institués prés le Ministére de l'Agriculture, du Commerce et des Travaux Publics pour l'etude de la Péripneumonie Epizootique du Gros Bétail."

"Gerlach says,—'The lung disease always yields to police regulations; whole districts, as well as individual farms, where the disease had existed for several years, have been invariably freed within a twelvemonth on the prescribed measures being rigidly carried out. Inoculation can be tried as a preservative in districts where the disease is very prevalent. The results are reported to have been as follows:—Out of 6864 head on which it had been tried, it succeeded in 5434 cases, and had no effect on 1430 cases; 113 head died in consequence of the operation, and 118 head of the lung disease; in this country it has not been tried, and the data we at present possess are insufficient to lead to any definite conclusion.'" *

In the same year, M. Marret, V.S., Allanche, published the result of his experiments on cattle in the department of Murat. The memoir is too long for insertion here, but we give his conclusions in an abbreviated form, and refer the reader for details to a translation of the article which appeared in the "Veterinarian" for October 1854, p. 578:—"These several amounts constitute a total of 855 animals, belonging to different landholders, on whose farms the epizoötic had made more or less considerable ravages. The success of inoculation proved in every case complete, save some trifling accidents happening at a time when inoculation was far advanced. In the face of similar facts equally varied and numerous, of which the greater part are established by a considerable lapse of time, can any doubt remain of the preservative property of pleuro-pneumonic virus? I do not think it. This question appears to me finally set at rest."

The proposition of Dr Willems, recommending inoculation as a safe preservative against pleuro-pneumonia, was warmly encouraged by Didot, Ercolani, Corvini, and others; but decided opposition was subsequently developed, and vigorously prosecuted, by some of the most eminent men of the day.

We now come to the report of the Commissioners appointed by the Legislative Assembly of New South Wales which appeared in 1864. The appearance of pleuro-pneumonia in the colony in 1862 spread great alarm abroad, probably intensified by the knowledge that in the neighbouring colonies all the means for its extermination had failed, and the sums voted by the Legislative Assembly were completely exhausted, while the disease

* Report of Murrain in Horned Cattle, by E. Headlam Greenhow, M D. 1857. P. 67.

was spreading as rapidly as before. The Commission was appointed to consider the subject in relation to compensation for cattle slaughtered, together with the various remedial measures which had been adopted by owners of stock, and especially the results of inoculation. The report gives the particulars of lengthy examinations of different witnesses, and concludes with the following contradictory paragraph :—"Your committee cannot conclude their report without some reference to inoculation; and, from the evidence which has been given by Messrs Pottie and Bruce, and several other parties who have tried it, apparently with great success in both diseased and sound cattle, it appears to your committee that if it is judiciously performed at an early stage of the disease, there will be no necessity in future to resort to destruction of infected cattle, unless they are attacked very severely; and they strongly recommend as a preventive that the increase should be inoculated while young. But sufficient time has not elapsed since the operations were performed to test their efficiency, so as to warrant your committee in giving a decided expression of opinion whether inoculation can be considered as a cure, or preventive, or both."

The evidence of Mr Pottie contains the following extraordinary statement :—"I believe it [pleuro-pneumonia] is contagious, and this, I think, is proved by the fact that by inoculation we can produce an artificial disease by means of the virus taken from a diseased animal. We cannot, so far as our experiments have been made, produce lung disease by inoculating another part of the animal; but we can produce a disease similar in its character, in another part of the animal, to that which we find produced naturally in the lungs."

Next we have the conclusions of Dr Reviglio, a veterinary surgeon of eminence of Turin. He gives a summary of the various reports which have emanated from the different governments, and from these, as well as from his own experiments, he deduces :

"1*st*, That this inoculation, discovered and recommended by Dr Willems, is not based on scientific principles."

"2*nd*, That all the facts obtained by the several experiments have concurred in showing that the *virus*, when introduced into living tissues, produces inflammation in no way different from that caused by setons, &c., except that it has a greater tendency to a gangrenous result."

"3*rd*, That if we admit its revulsive effects, it still possesses no advantages over therapeutic agents in common use in veterinary practice."

"4*th*, That as inoculation is frequently followed by serious and sometimes fatal consequences, it is just and reasonable to give a preference to the usual derivatives."

"5*th*, That should it happen to be, as Dr Willems pretends, a prophylactic, for which there seems, however, to be no valid ground, proofs are wanting of the inoculative qualities existing in the serum exuded from the lungs, and, therefore, its employment can be of no benefit."

The Belgian Commission, which had been continuing its investigations, issued its fifth report in 1858, which was adopted at their sitting of the 3rd April of that year. Of the members present there were MM. Thiemesse, chairman, Delwart, Gaudy, Verhezeu, and Crocq, secretary and reporter. Having carefully examined and analysed the investigations and conclusions of previous commissions instituted in Belgium as well as in other countries, and also of the experiments of the present committee, they arrived at the following conclusions:—

"1*st*, The inoculation, well performed, is an operation unattended with bad consequences. The accidents resulting from it are in very small proportion, when the operation is performed in proper season.

"2*nd*, In Belgium pleuro-pneumonia has reached its decline. The fact annihilates the value of the cases in which its cessation was attributed to the inoculation.

"3*rd*, In Friesland the inoculation does not appear sufficient to stop the progress of the epizoötic.

"4*th*, In numerous cases pleuro-pneumonia manifested itself more than fifteen days after inoculation, and sometimes even later.

"5*th*, The local phenomena of the inoculation, and of those of pleuro-pneumonia, may develop simultaneously with equal intensity.

"6*th*, Inoculation does not constitute a sure preservative against pleuro-pneumonia of cattle.

"7*th*, Inoculation has perhaps the property to diminish the frequency of cases of pleuro-pneumonia, and to retard the epoch of its invasion.

"8*th*, Revulsives appear to possess the same property."

In 1861 there was published a blue-book,* giving some very important particulars with reference to pleuro-pneumonia in Holland. It is a somewhat lengthy document, and, therefore, brief references and observations must suffice here. The report alludes to the results of the institution of preventive measures as:—

a. For checking the disease: 1. Laws or ordinances; 2. Attempts at cure.

b. Inoculation as a mean of preventing infection.

c. Insurance as a means of diminishing individual loss.

* Reports by Her Majesty's Secretaries of Embassy and Legation, 1861.

On these heads the report gives information which we summarise as follows:—

There was a decided difficulty in carrying out the principles of the general law. Proprietors did not receive any compensation for the compulsory slaughter of their cattle, and, therefore, scrupulously kept the presence of disease in their stock a profound secret. Contemporaneous with this fact, exportation being also prohibited, the non-removal of cattle caused a fearful and rapid extension of disease.

In provincial places, however, different results were obtained. *The introduction of diseased cattle was prevented. Compensation for slaughter and death was allowed, and in numerous instances the disease was entirely confined to the place where it originally broke out.* In Friesland the precautions were badly observed and disease prevailed extensively. In Zealand the absence of disease was insured by the observance of the law, and on account of its peculiar situation. In "Groningen and Drenthe, where all the infected cattle are destroyed, the disease is inconsiderable." With regard to inoculation, the reporters state that it has been employed with success attending extensive trials. "It has been necessary to encourage it by providing means for performing the operation at the public expense by rewards to veterinarians and to farmers, and by compensating for loss and injury to cattle which had been inoculated. This was necessary both on account of the reluctance of farmers to disclose the existence of disease in their stock so long as it could be safely concealed, and also because of general prejudice against the remedy. The result of two years' experience of this system in South Holland was that it became well known and generally applied thoroughout the greatest part of the province; that the apprehension of mischievous consequences diminished; that the preventive power of the remedy was admitted on account of the few instances in which inoculated cattle had been subsequently attacked by the disease; that the disease perceptibly diminished in the commune where inoculation was most generally applied, while it continued to exist where little or nothing was done in the application of these means; that inoculation could be safely resorted to in uninfected stalls without fear of thereby infecting uninoculated cattle; and that the practice of it in infected stalls, while it secured the healthy cattle from infection, checked the development of the disease in the infected and apparently still healthy."

There are several points lost sight of by the reporter, and in their absence the arguments in favour of inoculation appear to gain considerable strength.

The farmers maintained a studied secrecy in reference to the existence of pleuro-pneumonia in their cattle, and by illicit removals, as well as keeping the animals crowded together, the

disease was spread. The same continues in this country at the present time. The farmers of Holland are recommended to inoculate, but they have a natural prejudice against it, and the government, in order to get it adopted, as well as to induce the farmers to disclose the existence of disease for the purpose of slaughter, distribute rewards among them as well as the veterinarians who perform the operation at the public expense, and also allow compensation for animals dying from the operation or slaughtered by command of the executive. The success of the proceeding entirely lay, we have no doubt, in the vigilant slaughter of the diseased animals, and the decline of the disease is to be attributed entirely to the diminution of centres of infection, viz., diseased cattle. The statement of the reporter which refers to the alleged safety in the practice of inoculation, we take as a positive proof of the non-existence of the virus of the disease in the fluid made use of. It does not appear possible to communicate pleuro-pneumonia by this means, and we feel confident in the asseveration that if the fluid really contains "the virus," which we believe is of a highly volatile and imponderable nature, no uninfected animal can be safe wherever it is taken.

We are further informed that of the number of cattle inoculated in the province of Groningen in 1854, no less than 16 per cent. died, which number includes those dying of pleuro-pneumonia *contracted before inoculation.* How, we may inquire, are we to understand from this statement, that inoculation is a preservative against pleuro-pneumonia, and that it ensures at least a milder and a manageable form of disease if not perfect immunity.

In 1861, dated October 12th, a report appeared in the "Melbourne Argus" of 17th of same month, from the commissioners of Victoria in reference to the prevalence, nature, and treatment —remedial and preventive—of epizoötic pleuro-pneumonia. It deals with each branch of the subject clearly and in a masterly style, and it is curious to notice that while the most stringent enactments are recommended for limiting the spread of the malady, as by slaughter, segregation, and limiting the movement of diseased animals, *the operation of inoculation is passed over in complete silence.* It was well known that Mr Bruce had long been clamorous for an edict to render inoculation compulsory, as he is at the present time, yet in the face of all his vaunted success, a commission composed chiefly of scientific men ignore entirely the proposal. The fact, taken into consideration with previous reports as well as others which followed, is not without great significance.

In 1862 one of the commissioners, Mr John Miscamble, V.S., who assisted in producing the report just referred to, addressed the chief secretary on the subject of inoculation for pleuro-

pneumonia. The report appeared in the "Melbourne Argus" of 6th November 1862, and the writer goes on to assert the value of inoculation, which, he says, "is recommended by the first professional authorities of the day to check or eradicate the fatal disease now attacking sheep in England. It has saved, and will save, the bovine race of this colony to us." He says not more than one per cent. of the inoculated animals exhibited the dangerous symptoms, and theremainder required no more than ordinary care. Some few died, and in five per cent. of the remainder in which the initiatory signs of the disease manifested itself, the plague was stayed by inoculation. In other herds, one-third of which was already decimated by death, the remaining two-thirds were saved. These figures constitute the whole of Mr Miscamble's statistics, which, taken with his share in the previous report, seem to point to the probability that his experience of inoculation was but recent, and embraced as a popular remedy. His boastful prophecy of the saving effects of inoculation is not yet fulfilled as far as Australia is concerned.

In 1863, Mr Alexander Bruce addressed a letter to the Honourable Minister for Lands, New South Wales, informing that personage that, as Chief Inspector of cattle, he had operated on more cattle by inoculation, and saw no reason to alter his opinion of its efficacy; and while he attributes success to it he also states that he recommends slaughter to the apparently healthy remnant of the herd.

A little further light appears to be thrown upon the Australian efforts by a letter which appeared in the "Edinburgh Veterinary Review," vol. 5, page 775.

"A correspondent writes from Denilquire, in a letter bearing date of 21st September 1863, that pleuro-pneumonia is raging here to a fearful extent. Inoculation (as performed here) seems to have but little effect. . . . The papers are full of complaints of the diseased meat, and some of the doctors say that it is causing sickness among the people; and children are ill by using the milk of cows that are diseased. I hate the sight of beef myself, as during the week I see a good many killed, and none of them but are more or less affected. I am *quite certain* that inoculation, *properly* carried out, *is good*, but they want to be more particular in the 'lymph' that is used. In Australia everything is done in a hurry; but I think before long they will have to be more particular, as government is taking measures to prevent the sale of diseased cattle for slaughter. The foot and mouth disease has never affected cattle here."

It remains now only to notice the references to inoculation

which have been made by authorities in our own country. Professor Gamgee* says:—

"The practice of inoculation I have to condemn from experience. It does some good, but a great deal more harm. The good is only such as may follow the use of setons, and is obtained at the cost of a certain percentage of deaths, and cases of gangrene of the tail. It is not an infallible preservative, but very far from this, and it simply tends to keep up the disease in the country by turning the attention of people from the true means of prevention." At page 614 the Professor continues:—"The all important question—'is inoculation of service?'—has, in my opinion, been solved. I cannot deal, in the pages of this little work, with the large amount of conflicting evidence on the subject. The Belgian and French commissions, Reviglio's, Simond's, Hering's, my own observations, and those of many more, prove that a certain degree of preservative influence is derived by the process of inoculation. It does not arrest the progress of the disease. It certainly diminishes it to some extent, though often very slightly so, the number of cases, and particularly that of the severe ones. This effect has often been ascribed to a derivative action, independently of any specific influence, and indeed similar to that of introducing setons in the dew-lap. I cannot speak very favourably of the latter process, as indeed I cannot recommend that of the inoculation of cattle. In London some dairymen have considerable faith in this operation, though its effect is uncertain, and its *modus operandi* a mystery. I should counsel the keeper of dairy stock to select his own animals from healthy herds, and strictly avoid public markets. In many instances, to my knowledge, this has been sufficient to prevent the invasion of this terrible disease."

The conclusions of Professor Simonds, although written in 1853, retain all their freshness, and will be read with interest as though pertaining to the most recent experiments. For this reason they are produced last in order.

"1. That inoculation made by superficial punctures and simple erasions of the skin invariably fail to produce any local inflammatory action, being the reverse of the case with regard to vaccine disease, small-pox, and other specific affections, of which it is an indication of success.

"2. That the employment of *fresh* serous fluid, and a cleanly made but *small* incision, during the continuance of a low temperature, will almost always fail to produce even the slightest amount of inflammation.

"3. That deep punctures are followed by the ordinary

* "Our Domestic Animals in Health and Disease," pages 612–614.

phenomena *only* of such wounds, when containing some slightly irritating agent.

"4. That with a high temperature, roughly made incisions, and serous fluid a few days old, local ulceration and gangrene, producing occasionally the death of the patient, will follow inoculation.

"5. That *sero-purulent matter*, taken from an inoculated sore, causes more speedy action than the *serum* obtained from a diseased lung, and that *removes* cannot be effected on scientific principles.

"6. That oxen are not only susceptible to the action of a *second*, but of *repeated inoculations* with the *serous exudations* of a diseased lung.

"7. That an animal inoculated with the serous exudation is in *no way protected even from the repeated action* of the sero-purulent fluid which is produced in the wound as a result of the operation.

"8. That animals not naturally the subjects of pleuro-pneumonia, such as donkeys, dogs, &c., are susceptible to the local action, both of the serous exudation from the lung, and the sero-purulent matter obtained from the inoculated wounds.

"9. That the serous fluid exuded from the lungs is not a specific 'virus,' or 'lymph,' as it is sometimes designated.

"10. That inoculations made with medicinal irritating agents will be followed by similar phenomena to those observed in inoculations with the exuded serum.

"11. That inoculation often acts as a simple issue, and that the security which at times the operation apparently affords depends in part upon this, but principally on the unknown causes which regulate the outbreak, spread, and cessation, of epidemic diseases.

"12. That inoculation of cattle, as advocated and practised by Dr Willems and others, is not founded on any known basis of science or ascertained law, with regard to the propagation of those diseases commonly called specific.

"13. That pleuro-pneumonia occurs at various periods of time, after a so-called successful inoculation.

"14. And lastly, that the severity of pleuro-pneumonia is in no way mitigated by previous inoculation, the disease proving equally rapid in its progress and fatal in its consequences in an inoculated as in an *un*inoculated animal.

(Signed) "JAMES BEART SIMONDS."

The practice of inoculation has been conducted some years by Mr Priestman, M.R.C.V.S., Caledonian Road, London, and at one time, about ten years ago, we were frequently informed of the wonder-working of the same, but subsequently the

subject appeared to subside as a story that has been told. In the "Veterinarian" for January 1870, the question is thus alluded to in the leading article :—

"Mr Priestman has been very successful in arresting the course of the disease by the use of carbolic acid; and, we believe, prefers it to inoculation, which he at one time extensively practised."

The proposed experiments for testing the use of inoculation in Norfolk,* were carried out by Mr Smith, M.R.C.V.S., in November 1869, and his report, which contains, among others, some useful memoranda. The results are similar to those already arrived at by other persons and commissions, and incontestably proves that some preservative influence is conferred by inoculation, that animals contract pleuro-pneumonia after it, and that no true disease as pleuro-pneumonia is produced by the operation. Mr Smith inoculated 87 animals; 12 were afterwards attacked with pleuro-pneumonia, of which 9 were slaughtered, 3 recovered wholly or partially, and 75 remained healthy and well. In conclusion the reporter adds :— "I do not attach much importance to the experiments. They are, in my opinion, insufficient and incomplete. I think, however, they incontestably demonstrate two facts:—First, that pleuro-pneumonia inoculation, when scientifically performed, is a harmless operation, and not likely to cause an extension of the disease, and that the loss of animals' tails and other untoward effects, when they occur, are produced by the ignorance and want of skill of the inoculator; Secondly, that it differs in most essential points from the conditions induced by inoculations in other contagious diseases, such as small-pox or cattle plague. In the inoculation for pleuro-pneumonia we have a total absence of the manifestations apparent in other inoculations."

In the "Veterinarian" 1870, page 384, under the head "Pleuro-pneumonia," we are informed that "Many fresh outbreaks have also occurred in the London dairies, both among cows which have been inoculated as well as those which have not been subjected to this operation." In the same journal, p. 928, referring to December 1870, pleuro-pneumonia is said to have suffered a slight decrease since the previous month, twenty counties of England and nine of Scotland being still contaminated. "In the Metropolis there are many cases of the disease, and some of the dairymen are adopting the plan of clearing out all their old stock upon the occurrence of a case, by sending the animals to the butcher, and not making new purchases from the country until their premises had been thoroughly disinfected."

Coming to the present time, October 1875, official returns inform us that pleuro-pneumonia still maintains its usual degree

* Report to Norfolk Chamber of Agriculture.

of prevalence, and is in no way mitigated by the influences exerted to suppress it.

We are likewise helped to valuable information from other countries. In Holland, finding that in the absence of legal means, yet with rewards to farmers and veterinarians, and recommendations to owners to practice inoculation, the disease still prevailed and committed great havoc, the Government instituted official inspection in order to find out the cases, carry out segregation and inoculation gratuitously, as well as provide compensation for animals dying from untoward results. By these means a considerable diminution of the scourge has taken place, believed, of course, to be entirely due to the separation of the diseased from the healthy rather than to any prophylactic properties of inoculation, which, by the way, was only very partially carried out, as the farmers had imbibed the idea that it spread the disease.

From Australia we learn that in order to bolster up the falling fabric of inoculation:—"Circulars were distributed among the stock-owners of the Colony, asking for their individual opinions for or against the efficacy of inoculation, as a preventive of pleuro-pneumonia. To these 1145 circulars there would appear to have been obtained 804 replies, from all parts, from Albany to Young. Of the 804, there are just 310 who may be allowed to speak from actual experience in favour of the inspector's views. There were 341 who returned no answer, 183 who thought neither one way nor other, 81 against the practice, and 452 who, having no inoculating experience, only offered an opinion second-hand. Now, surely this is not the unanimity of opinion that the public have been led to understand existed in the minds of stock-holders on the subject? Furthermore, no details are given of the opportunities or capacity for judging of those who have offered positive belief in the matter. We know not whether they owned one cow or 1000 oxen; whether they were familiar with experimental methods of testing scientific theory; what pains were taken to eliminate sources of fallacy; or whether their trials are made by rule of thumb only. We have had ample experience of how easily men are misled into errors and blunders through following their own preconceived notions on such occasions. Our own pleuro-pneumonia commissioners afford us an excellent warning upon that point. They were to a man all non-contagionists, from Ralph to Rowe and M'Coy, and they fetched healthy cows from Tasmania, where pleuro had never been, placed them in stalls beside diseased animals, got there in abundance, inoculated them in various crucial ways, and then declared their inability to communicate the fever by contagion, reported the result to the Legislature, and based upon their failure an advice deprecating any further legis-

lative interference or alteration of their veterinary police; and yet, the Government printer's ink was hardly dry upon their notable report when a counter report came from the butchers of Geelong, who had bought for slaughter the experimental bullocks, that the animals were all diseased, unfit for human food, and demanding back their money." *

Before we conclude this report, we would direct the attention of the reader to an article—the Leader—in the "Veterinarian,"† entitled the "Contagious nature of Pleuro-pneumonia," in which is given a number of useful experiments by Professor Simonds, to determine this question. They were communicated to the Royal Agricultural Society, and appeared in their journal, vol. vii. S.S., part 2, and again with fuller details in 1874. We are the more inclined to value these experiments because they not only determine an important point in reference to the mode by which the disease is propagated, but they also conclusively elucidate, we think, that question relating to the non-existence of a "virus" in the fluid expressed from the lungs. It has been pointed out already, that in order to produce any contagion in a healthy animal the particular poison of that disease must first be introduced to the circulation, and we have no doubt in determining such an event when the virus and a healthy animal are both present. The serum of the blood, secretion from the nostrils, or products of characteristic wounds, are the respective means by which disease is communicated; for instance the discharge from a farcy wound in the horse will communicate genuine farcy in another horse, and also to man; the nasal discharges of a glandered horse will likewise produce identical glanders; the fluid from the vesicle of small-pox in sheep or man will give rise to the same diseases in the appropriate species; and the saliva of a rabid dog will generate rabies in another animal even of different species. In "the virus" we recognise the specific poison of a given disease, and any fluid, secretion, or excretion of the body containing such virus, when introduced to the healthy body of another animal by means of the circulation, mucous membranes, &c., it produces the genuine malady in every way like that from which the first animal suffered. This law holds good in all those diseases for which we practice vaccination, a mild method of inoculation by which a mild form of the disease is induced, sufficient to ensure the person against future severe attacks at least; and the object of inoculation is that of producing such mild form of disease that shall confer such immunity, which would be very desirable. On the contrary, however, we do not recognise the least resemblance to pleuro-pneumonia from inoculation with fluid from lung tissue of diseased animals. The veritable disease is located in the lungs, and inoculation by "the virus" should,

* "Veterinarian," Sept. 1875, p. 681. † Ibid, p. 722.

according to the established law, produce lung disease of the particular type, though in a milder degree. Instead of this we have as the usual result a small local sore, which heals rapidly, and, in many cases, gives rise to no constitutional disturbance; and in exceptional cases, when the local signs are severe, such as extreme swelling of the tail and regions of the hips, anus, &c., accompanied by gangrene, loss of the tail and muscular substance, the lungs may become the seat of a secondary disease, in which abscess and gangrene are associated. There is, therefore, not the slightest analogy in the conditions. Pleuro-pneumonia consists of a peculiar inflammation of the whole of one or both lungs, but the lung disease from inoculation by the so-called pulmonary virus is nothing less than pyæmia, the result of the absorption of putrid elements, and the effect a blood poisoning, generally of rapid nature. Instead of being general, or spread through the whole of the organ, it is isolated and situate within a mass of healthy tissue.

Considerable stress has been laid upon probability of disease being already in an incubative stage in those animals which fall victims to pleuro-pneumonia immediately after inoculation. Of this there can be no doubt, and in this fact we recognise another grave reason for doubting the existence of the virus, for in accordance with the assumed law, are we not justified in expecting that the malady will lose much of its intensity and danger by inoculation. But we have seen repeatedly this is by no means the case. In one herd of cattle which we assisted to inoculate, these effects were painfully developed. The stock consisted of upwards of 50 head of two-year-olds and upwards. On our arrival a cow going through a tolerably mild form of the disease was slaughtered, and the fluid extracted from the lungs was injected, by means of a syringe, beneath the skin on the lower end of the tail of each of the others. In a few days another was seized and *died*, and at different periods, varying from days to weeks, others fell victims to the genuine disease, pleuro-pneumonia, but none showed any ill effects from the inoculation.

We have here one out of many proofs which might be given, that when pleuro-pneumonia is once within the system inoculation does not always lessen its effects; and further, it does not always prevent the animal afterwards becoming infected. In the instance given, the disease was at first brought by one animal; this infects others, and they are inoculated while they are infected—that is, before any appreciable signs of disease are to be observed; but there are others not infected, and these are inoculated also. Subsequently the disease is developed in the first, and they manufacture more poison germs, which float through the air and reach the healthy cattle; at length they successively fall victims to ordinary exudative pleuro-pneumonia

at remote periods, consistent with the process of incubation. If it were otherwise, the inoculation, having been performed at one time, should give rise to a *contemporaneous* appearance of the usual symptoms, marked by a similar crisis and decadence. Experience, however, decidedly proves the reverse.

The conveyance of the contagion of pleuro-pneumonia can be readily referred to circumstances and events in which exposure was permitted. About forty days has been found to elapse in the majority of cases witnessed by the writer between the time of infection and appearance of signs. In one notable instance, an individual who was making experiments with diseased cattle incautiously went direct from them to a fine herd of dairy cows, some miles distant, in a clean, uninfected locality. At the expiration of thirty-nine days one was taken ill, others followed successively, and the whole were sacrificed. We have seen certain infection to occur from the use of an uncleansed thermometer, indiscriminately and intentionally used upon healthy animals after being applied to the rectum of those already suffering. Such cases go to show the existence of the virus, and the production of the essential disease by simple means, by which, or doubtless some modification, the disease is generally conveyed. As yet we believe the true method of inoculation is not known; the simple fluid containing the necessary "virus," which shall produce the exact disease, but in such a mild form as to answer all the desirable ends, is still unobtained; and, were it even present with us, we have to confess we do not appreciate its value. It is no part of our desire to underrate this operation. We refrain from doing so because we recognise in the alarming prevalence of pleuro-pneumonia throughout the British Isles, and most of the countries of the European Continent, as well as in South Africa and Australasia, at the present moment, as one of the best and most conclusive pieces of evidence which can be adduced of the inutility of the so-called inoculation. If the alleged immunity from the disease is really obtained by inoculation, and, as we have been informed, that hundreds, nay thousands, of animals have been successfully operated upon; also that eighteen out of every twenty proprietors have tried it, and regularly adopt it, how is it, we ask, that the disease is actually increasing around us? In the London dairies, as well as the cow-houses of Manchester, Liverpool, Edinburgh, and Glasgow, the process of inoculation may be seen almost any day. There are also hundreds of animals to be observed with their tails bandaged up, a piece of diseased lung tissue being strapped over the wound; and, notwithstanding this, the existence of the disease is denied, and even a defective system of inspection proves its lamentable prevalence and spread from place to place.

The absence of exanthema, or external eruption, as a natural

sequel of pleuro-pneumonia, appears to throw considerable difficulty in the way of inoculation. There are no external vesicles or pustules from which to obtain "the virus," as in other contagious maladies; and, if we take the serum of the blood, the probability is, the veritable disease in its worst form may be established, and we are no nearer obtaining the desirable end. Inoculation at present affords so little hope, that it becomes a pressing question whether we are not neglecting golden moments in which to deal with the disease more safely and with expedition. The experience of Britain is that of the known world where cattle traffic is carried on, and that is, internal safety from foreign animal plagues, and the avoidance of useless and harassing restrictions can only be obtained by regulating—not impeding—the importation of foreign animals. If those gentlemen who recently waited upon the Home Secretary in the character of public benefactors, but who in reality are first actuated by their own desire for prosperity, are really anxious to avoid, as they say, famine prices in meat, let them uproot the cause which they have planted on our soil, and, instead of live cattle being brought over in their ill-applied ships, let them bring the dead carcases of fatted animals. It can make no difference in choice whether they bring live or dead animals, if they only desire to bring us food; but it is a lame argument by which they seek to show us that the easiest thing is impossible, though it is done every week of our lives. It is sufficiently obvious that the plagues at present stalking through our land are imported and spread by the animals suffered to go over the length and breadth of it, and it is out of the power of inoculation, or of any legal means affecting the movement of stock inland, to get rid of them while cattle are brought in alive. As soon as they are slaughtered at ports of debarkation, or brought over as already dead, we shall obtain a rapid and satisfactory decrease of disease; otherwise we can have no hope whatever of freedom. Flesh-food must advance in price, our native stock are seriously imperilled, and we run a certain risk of communicating so much disease to mankind by the flooding of our markets with questionable beef—the result of so many animals dying or slaughtered in disease.

If the existence of a virus in the fluid from the lungs were undoubted, the practice of inoculation would even then be most unjustifiable. It is decidedly a most impolitic measure to keep animals alive that are suffering from a malignant contagious disease. As long as they live they are spreading a poison, no matter how mild is that disease when developed. It therefore follows, that, by slaughter at that period when the malady is in incubation, we put a stop to that manufacture, and consequently also to the spread of disease. If we first encourage owners to

disclose the existence of disease, and compensate them for all that are slaughtered, we shall do all the necessary internal work, and the country might be returned under a clean bill of health in less than six months. Again, if we suppose we are conveying the virus to a healthy animal among others, how can we reconcile the statement that others will not become infected? The opinions expressed by the Secretary of Legation in Holland, that inoculation may be practised in non-infected places with safety, are the result of a loose and vague mode of reasoning. It is quite patent to all, that if we introduce the matter of contagious disease, we produce a contagious malady; if we possessed the virus it would be dangerous to carry it about, and quite on a par with keeping alive one of the worst forms of disease. It is fortunate for us we possess it not, and it will be still more profitable to us if we cease to dabble in scientific muddles, and take to common sense means of preventing disaster, which are not only well understood and sanctioned by ample experience, but are also at our very fingers' ends.

ON THE EFFECTS PRODUCED ON TREES AND SHRUBS BY SMOKE FROM PUBLIC WORKS.

By Robert Hutchison of Carlowrie, Kirkliston.

[*Premium—The Medium Gold Medal.*]

The rapid expansion of the commercial and manufacturing activity of the United Kingdom, during the past quarter of a century, in nearly every part of the country, and the consequent erection and enlargement of public works of various descriptions, —while of paramount importance to the social well-being and industry of teeming thousands of the population,—are, nevertheless, inseparably connected with the origin of latent evils which affect in a greater or less degree, according to circumstances, in the vicinity of such manufactories, the amenity and salubrity of the district, the growth and health of the adjacent crops within their influence, and the vitality of vegetation generally from the tiniest blade of grass to the tree of giant dimensions.

These pernicious influences are of various kinds and degrees, affecting the atmosphere, the soil, the water supply, or, it may be, all these together. For simplification they may be classed under the following heads:—

1*st*, Pollution of water-supply, and food of plants by chemical discharges from public works into open drains, water courses, or rivers.

2*nd*, Saturation of the soil from deleterious matters filtrating into it, and its consequent destruction for plant-life.

3*rd*, Atmospheric pollution by smoke, and other noxious vapours or gaseous discharges, whereby the pure natural air is vitiated, and rendered injurious to the respiratory organs of vegetable life, and an artificial atmosphere, as it were, by long continuance of constant smoke exhalations, is created, inimical to growth of plants, from its containing in excess large amounts of sulphurous and acid vapours.

Sometimes the effects so produced are individually sufficient to constitute a serious sanitary objection to the continuance of the works which cause them; but in many instances, where the intelligent practical application of chemical science and engineering has been called in to aid in mitigating or entirely removing the evils complained of, success has been achieved, without injuriously interfering with the industrial pursuits of those engaged in the particular manufacture; and it is to be hoped that in many other cases, where no remedial measures have as yet been attempted,—manufacturers will yet see it to be their duty,—while carrying on advantageously to themselves their commercial enterprizes,—to use every effort which science and experience may discover or suggest, to mitigate evils inseparably connected with their processes, but which are capable of amelioration in the interests of the amenities of nature and their neighbourhood generally.

With the clamant evils of river pollution, the government, last session, endeavoured (unfortunately without success) to grapple, but the subject is so important, that once fairly roused, as it has been, it will probably again form matter for legislation, until successfully settled; and in that way an immense source of destruction to vegetable life will be put an end to. With the gaseous vapours and smoke discharges from large public works polluting the air for miles around, the question is a more difficult one, and a problem of greater intricacy, and it is with the effects produced by this species of destruction to trees and shrubs that we have in this paper more particularly to deal at present.

Without specifying in detail the various noxious chemical ingredients discharged from large public works, and which differ in the degree and extent of injury which they create, according to the nature of their chemical composition, and vary according to the special description of work or process whence they emanate, it may be generally stated that the primary and chief destruction to vegetation in the neighbourhood of such works, or large towns, is caused by the *smoke* discharges from them, arising from the combustion of coal in furnaces, and by the gases and vapours that are produced during metallurgical processes of the chemical arts and manufactures. Vegetable life, in general, is very susceptible of impurities existing in the air around it, and even slight modifications in the proportions of its constituent

parts in their natural forms, more or less injuriously affect all growths, and chiefly those in shady or sheltered spots where there may be, to some extent, want of light, or defective circulation of air. The wonder, therefore, rather should be, that in the vicinity of large cities and manufacturing centres of industry, and sometimes even in their very midst, we see trees and shrubs existing as they do, and sustaining life under such abnormal conditions, with comparative hardihood. But, as will be afterwards explained, nature placed in circumstances so uncongenial may be artificially assisted in many ways, and induced, with a little attention and care to her subjects, to cheer and brighten with her freshness and greenery many a dismal town square or city walk.

In the immediate neighbourhood of chemical works, from which, by day and by night in ceaseless volume, large quantities of poisonous exhalations are poured forth into the atmosphere, the living functions of vegetation and tree-life are much more seriously crippled than by the mere smoke from coal-consumption near towns, and in such situations herbage of all kinds is stunted and browned, the very grass lingers on a feeble existence, trees are leafless and withered, and in a very few years cease to live. The same remarks apply to plants and trees in close proximity to the calcining hearths of ironstone pits and blast furnaces. The discharge from these of smoke strongly impregnated with the sulphate of alumina is highly deleterious to all life. Blown by a strong and steadily prevailing wind across any district, however fertile and highly farmed and cultivated it may be, the pernicious effects to cereals and green crops is most apparent, and cause great deterioration and damages annually to many farmers. In many parts of Lanarkshire, Fife, and Stirlingshire, the losses caused by these effects are severely felt, and although compensation by pecuniary payment be made in most cases where the damage has been proved, the indirect deterioration to the farmer, from lack of straw, and head, and bulb, from their more stinted growth, caused by the agency of this nuisance, is not compensated for by any pecuniary allowance. Again, in some districts in Ayrshire and West Lothian, as well as in Lanarkshire, the damage caused to dairy farms from the destruction to their produce by the deposit of soot-flakes, from these and other works, such as the shale oil manufactories, is very great; and it can easily be understood that the permanent injury to the perennial occupants of the ground, such as trees and shrubs, must be also very marked. If it were not for the presence of the chemicals already referred to, in the smoke issuing from these and kindred works, the mischief would not be nearly so serious, as the winter's snow and rain bleach the merely smoke-begrimmed trunk and branches, and thus clear out the plugged-up pores to a great extent periodically.

Probably the most fatal enemy to plant-life is an acid vapour termed *hydrochloric acid* (a mixture of hydrogen and chlorine). It is evolved among the dense white fumes issuing from most chemical works, and in a very short time causes absolute sterility to all land within its influence. Its poisonous effects upon a tree or shrub are first observed by the shrivelling up and drooping of the leaves, which in a few days are shed. The young wood buds lose their plump, healthy aspect, becoming scaly and falling off; the twigs then present a dead appearance, which soon spreads itself down the branches, the bark cracks and shrivels off, here and there on the stem, a young bud may in spring be seen struggling in the vain effort to develop itself into a new branch to sustain the failing vitality, but very soon these last attempts at self-resuscitation cease, and the tree dies.

The effects produced upon tree and shrub life by smoke from public works are similar in operation to those now described, and when the functions of the leaves in vegetable economy are considered, it will be easily understood how the health of plants is interfered with by these effects.

As the function mainly of the foliage of a tree or shrub, is to expose the secretions of the plant to light and air, and so to assist in the formation of wood, if the leaves are coated over by dense deposits of carbon and other substances, a film is formed sufficiently opaque to prevent the free action of light and air upon the leaves, and hence the secretions necessary for the formation of wood-buds are impeded in their development. Hence we see how stunted in stature, and in thickness of trunk, are trees in the vicinity of towns as contrasted with others of similar age planted in the open country, or in rural districts with an uncontaminated atmosphere.

Again, leaves have another most important function to perform in the healthy economy of trees and shrubs. They daily give off into the atmosphere large quantities of watery fluid by the process which they perform, called in technical terms *exhalation*. The importance of this function in relation to smoke deposit on the leaves, must be at once apparent. The moisture on the surface of the leaf, created by its healthy action, at once attracts the minute particles of carbon and other injurious ingredients which thereby adhere to the leaves, and, coating them over, at once arrest the healthy process of exhalation over the whole system of the plant; for as the leaf surface cannot find vent for the secretions pumped up from the root action, this latter function is next impaired, and a drag, so to speak, is put upon its healthy flow. The humidity of air which trees promote in their immediate proximity, by the process of exhalation, is very materially lessened by its cessation, and the moist and cool condition of soil, which is so essential to their welfare, is in its turn affected,

and the direct action of the sun's rays has more power and opportunity to cause undue evaporation. And with a decreased healthy action of foliage, or with a scant crop of leaves induced by the effects of such substances as have been referred to, another very important agency in sanitary economy is interfered with; for while leaves, doubtless, in the first instance, by the healthy action of their various functions, act for their own benefit; they, at the same time materially influence and conduce to the purity of the atmosphere itself, by their absorption of carbonic acid gas, which in excess is so injurious and fatal to animal life. Under the influence of light, leaves in a healthy state, and young green twigs and shoots of shrubs and trees, decompose this deleterious gas, and so contribute largely to the preservation of the purity of the air for man's own breathing.

But not only upon the leaves of trees and shrubs are the effects of smoke and other deleterious substances apparent, nor is it through their medium alone that the life of the plant is destroyed. The lateral air-vessels which penetrate the bark and stems of trees horizontally for the purpose of "oxygenating," as it may be called, the juices and secretions, form another channel by which the injurious and subtle poisons are conveyed into the system of the plant. The plugging-up of the mouths of these surface-absorbents prevents the inhalation by the bark of the moisture of the atmosphere, and in this way, acts prejudicially upon the growth and development of the alburnum or sap-wood, as well as upon the expansion of the new buds, and consequently upon the ultimate growth of the tree itself. A familiar instance may be given of the injury which accrues to a tree by the adherence of a foreign substance to the surface of the bark, if we notice the effects produced by smearing the stem with coal-tar, oil, or paint, so as to completely stop up the *spiracula* or pores of the bark for some considerable length up the trunk from the ground. The result will be found to correspond precisely with what has been stated with regard to smoke clogging the bark from atmospheric causes. The new buds will first be destroyed, and finally the tree itself.

Upon the various descriptions of trees and shrubs the effects of smoke or a polluted atmosphere are not always equally severe or rapid. Doubtless plants, like animals, may individually vary in regard to the delicacy of their constitution, and while some are much more susceptible than others of the alterations in the temperature and humidity of the atmosphere, it is quite possible that some plants may be injuriously, if not even fatally, affected by the presence of foreign inimical matter in the air, or soil, or food, from which others of the same species, of a hardier and more robust constitution, would scarcely suffer. But independently of this, there are species of trees and shrubs which are

found to thrive better than other species do when placed by the force of circumstances in situations inimical to their nature, or under conditions which injuriously affect plant life generally.

Coniferous trees and shrubs will not thrive—the phrase must be taken as comparative—in any polluted atmosphere; for as we have shown that trees and shrubs breathe through both the bark and the leaf, such species as exude or secrete gum or resin in any quantity are peculiarly liable to suffer from polluted air. In the case of such trees, soot and such-like substances cling to them, and when their resinous exudations become coated with carbon, the rain has no effect in removing it, but rather the reverse, as it washes down aqueous volumes of soot-impregnated water upon their branches and bark. In like manner, hard-wooded trees, possessing gummy or sticky buds and leaf sheaths, suffer in a similar way; and should not be planted in the near proximity of large public works, or in the open spaces in the midst of densely populated towns.

The varieties of trees and shrubs which will be found to thrive best (again using the phrase in a comparative sense) in smoky atmospheres, are deciduous hardwoods with smooth leaf-surfaces and scaly barks; as for example, trees like the plane or the maple. From the smooth upper surface of the leaf, much of the coating deposit which settles there is easily washed off by rain, while the constantly peeling off habit of the scales of the outer bark keeps up a recuperative process in the cells and pores communicating with the alburnum and inner bark surface for the oxygenation of the sap.

Many evergreens also possess remarkable vitality and power of resisting the baneful influences of atmospheric pollution. As a rule, such plants as possess a thick leathery leaf with smooth surface endure the effects of smoke with greatest impunity; such, for example, as the common ivy and Aucuba japonica, whose glossy leaves are easily cleansed, and consequently the epidermis is kept in a more healthy condition from the action of the rain, than is the case with those plants and bushes with a downy or hairy foliage. But although some evergreens may succeed well in smoky atmospheres, there seems no doubt that, owing to the complete renewal annually of their foliage, deciduous trees and shrubs have a marked advantage in those situations over the evergreen species; and where it is intended to plant under such trying circumstances, deciduous trees and shrubs should be preferred, and such varieties of them as we have indicated as possessing special qualifications for withstanding the injurious effects of an impure atmosphere should be selected.

The following list comprises such trees and shrubs as seem most adapted for culture in these situations:—Platanus occidentalis, Acer eriocarpum, Populus balsamifera, Populus fastigiata,

Populus alba, Quercus ilex, Tilia europæa, Fraxinus, Robinia, Cytisus Laburnum, Syringa, Ulmus, Ligustrum, Vinca, Viburnum Tinus, Philadelphus, Cratægus, Ampelopsis hederacea, Clematis, Aucuba japonica, Ailanthus glandulosa, Ficus Carica, Cydonia japonica, Hedera helix, Jasminum officinale, Rhamnus alaternus, Ribes sanguinea, Sophora japonica, Ilex aquifolium, Sambucus, and Leycesteria formosa.

Of course, in naming these it must be quite understood that their success in such situations is merely comparative, and such of them as may be classed as flowering shrubs cannot be expected to blossom at all freely under the disadvantageous circumstances of their situation.

But it may be said, are there no remedies for the pollution of the atmosphere by public works and smoke-creating nuisances? This is a very delicate question, but one which will stand discussion, inasmuch as the Public Health Acts, the Smoke Consumption Acts, the Alkali Acts (in England), all seem more or less to have been framed for the suppression of such noxious discharges as poison air and destroy the amenity of whole neighbourhoods. A more stringent application of their enactments and enforcement of their provisions would doubtless in many places tend greatly to the mitigation, if not the abolition, of the evils complained of, where the manufacturers themselves (the pollutors) are disposed to act fairly and liberally. But in many other instances, such, for example, as calcining of ironstone, it is next to impossible, without absolutely stopping the process, to cure the evil. No doubt, when the injury to crops became very serious the operation of calcining might be prohibited, excepting during the winter season or non-growing period of the year, when there would be no risk of damage to crops, whether cereal or otherwise. Indeed this remedy is practised in some districts where the ironstone is wrought in connection with coal, and is found in too thin a state, or in such small quantities that the damages to be paid for smoke pollution to crops would outrun the value of the calcined mineral. The stone is accordingly raised with the coal and "binged" on the hearth till the harvest is carried, when the fires are lit and the process completed.

Much, however, might be done by artificial means to aid nature in many instances when placed in situations so uncongenial to her well-being, as in the midst of towns or in their immediate vicinity. A very few adventitious appliances of no costly description would tend greatly to compensate to many town gardens and shrubberies for the conditions inseparable from their lot. These may be briefly summed up in the following recommendations:—(1) Give more free space around each individual tree; (2) Prune early, regularly, and judiciously; (3) Soak well during drought the entire garden; and (4) Top-dress

with fresh soil over the roots and shrubberies occasionally. The first is rendered absolutely necessary by the confined circulation of air in town situations and vitiated conditions of the atmosphere, combined with the frequent absence of light in such localities; and which is so essential an element in tree-growth. The second suggestion is proposed, with a view to the proper balance of head and due development of upright stem, and to prevent a flat-headed habit being acquired, to which trees in such sites are extremely prone—a habit which results in one or more of the stronger-growing side branches outrunning their neighbours and interfering with the upright form of the tree. Branch and stem pruning, and foreshortening the upper tiers of branches in the head, will be found most beneficial in trees so situated, when about from twelve to twenty feet in height; although gentle hand pruning should be commenced at a much earlier stage in their growth. The third recommendation we have made is a very important one to all trees which suffer from the smoke about towns, and although the moisture of our climate and frequency of rains mitigate to some extent the evils produced by the sooty deposits, nevertheless much may be done by judicious watering, especially to shrubs. A short supply of water at the roots, causing the premature shedding of the leaves before they have fulfilled their functions—a process which they require longer time to perform, owing to their vitiated and debilitated condition rom the smoke and soot—is the principal cause of disease and stunted growth of town trees. Drains, both surface and underground, and hard paved streets, and walks impervious to water in the vicinity of tree roots,—as must be the case more or less in all large towns,—draw off the rainfall which in natural circumstances would go to supply the root moisture, and consequently in most situations of the nature referred to, only a very limited quantity ever reaches the rootlets and spongeoles at all. Thus summer watering and a thorough soaking, in dry, dusty weather, which could be quite easily accomplished in any town public gardens by the aid of the fire brigade engines, would be of immense value in restoring the proper equilibrium of moisture and health to the plants in such places, and an experiment which would repay itself in the enhanced amenity of the walks and gardens. The fourth and last suggestion made for the amelioration of tree and shrub culture in smoky localities, namely,—top-dressing the roots occasionally with fresh loam, is rendered necessary in such situations, by the loss which the soil sustains every season by the removal of the fallen leaves which in ordinary circumstances in the forest or park, would go to nourish and refresh as manure the surface of the ground, whence the decomposed ingredients are carried down by the winter's rainfall and action of frost into the soil, forming food for those young rootlets near the surface, which,

ramifying amongst the otherwise exhausted earth, acquire a stunted growth, and will produce impaired root action, unless Nature's own and recuperative process, when removed by the force of circumstances, is replaced by artificial means.

ON THINNING PLANTATIONS AS APPLICABLE IN PRACTICAL FORESTRY.

By Christopher Young Michie, Forester, Cullen House, Cullen.

[*Premium—Five Sovereigns.*]

Practical forestry, I consider, may be defined as signifying the growing of the greatest quantity of the most valuable wood or timber, upon the smallest piece of ground, in the shortest period of time.

To grow a large quantity of wood is a very desirable thing, but the operations of forestry may and often are so conducted as to increase the quantity at the expense of the quality. We have all seen large bulky trees, so coarse and knotty and open in the grain, as to be unfit for almost anything. Scots fir, for example, grown on rich loam, or on certain descriptions of moss soil, is of such a rapid growth as to render the wood useless for anything except fuel. Quantity of wood is therefore no index to good forestry, but when combined with quality, the case is essentially altered. The largest and best are qualities sought for in a tree, and I hope to show how they are to be produced.

The size and quality of trees are in themselves very good, but wood as well as gold may be bought too dear, or cost too much, and if gold may be bought too dear, wood may also be grown at too great expense; and when this is the case, practical forestry is not successfully carried out. One thing above most others very materially influences the value of wood, that is the cost or value of the ground it occupies during its period of growth. If the ground, for example, at 10s. per acre can be made to grow as much timber of equal quality as another acre can at 15s., it must appear evident that the former is the most profitable, and only such should be planted. As certain descriptions of ground, however, grow certain species of trees better than others, an important consideration here arises as to what species of trees to plant upon the different kinds of soil. The importance of this matter is paramount, because, in the first place, when once the trees are planted they in a sense grow of themselves, unaided by man. Hence it becomes every planter's duty to see well to it that only suitable trees are planted.

The length of time which a single tree or crop of trees takes to attain its highest possible value is an important matter, because if one forester can grow a crop of trees as valuable in fifty years as another can in sixty years, then ten years would be thereby gained, which would represent one-sixth of the producing cost, &c. When all these and other relative matters are kept distinctly in view, the operations of practical forestry become better understood, and the modes of carrying them out greatly simplified.

In addition to practical forestry, however, we have sheltering forestry, which consists principally of belts, stripes, groups, and single trees, the object of which is to produce warmth and shelter to animals in the fields, and to dry and ameliorate the climate. This branch of forestry is indeed more an auxiliary to farming, and a means of making farms pay, than that of producing profitable returns from planting. Indeed, trees grown either as small groups or narrow belts will not fulfil the conditions laid down for practical forestry.

We have also ornamental forestry, differing from both the other two in almost every respect. Ornamental forestry comprises hedge-row trees, certain lines and groups distributed over the landscape, and single trees so grown, either alone or combined, as to produce certain well-known but indescribable effects.

Experimental forestry is also another branch which embraces the pinetum, shrubbery, and certain departments of the nursery. It is designed to grow trees of new importation, to see what they will attain to, find out how certain species of trees enjoy or dislike each other's presence, how certain trees thrive in different kinds of soil, &c. These are all interesting, instructive, and important branches of forestry, and should each be studied and practised separately, and in accordance with their importance and worth.

In this paper, however, the writer intends to confine himself exclusively to that branch of practical forestry termed thinning. If thinning were rightly understood and properly attended to, pruning would be almost unnecessary, for it is either from superabundance of room on the one hand, or too little on the other, or from having stood too closely together at one stage of their growth and receiving too much thinning at another, that produces most of the necessities for pruning. I shall endeavour briefly to show how far and to what extent thinning is necessary to produce the desired results of practical forestry. I have stated (be it observed) that quantity is required—I mean quantity of timber, not number of trees, for while it is true that two sixpences are of value equal to one shilling it does not follow that two small trees are of equal value to one large one. Two trees containing 20 feet each may be of as much value as

one containing 40 feet, but two trees containing only 10 feet each are not so valuable as one containing 20 feet.

The following is the system of thinning practised by the writer, and which, after a trial of many years upon an extensive scale, he finds attended with such favourable results as to inspire him with confidence to recommend it to others :—

No. 1 is an enclosure of 500 acres, and between six and twelve years planted—the youngest part six and the oldest twelve. It is situated between 500 and 800 feet above the level of the sea, and covers both sides and top of the hill, which extends north and south. The exposure is severe on all sides, but most so on the north and east, which slopes towards the sea, which is distant about four miles. On that side all evergreens, including the Scots pine, are seriously injured by the sea air in winter.

The plants are composed of Scots pine, larch, and a slight mixture of Norway spruce and Silver fir.

The quality of the soil and subsoil varies considerably, but consists chiefly of a mixture of sand, clay, and gravel as the surface soil, and gravel, less or more inclined to moor pan, as a subsoil. The natural herbage consists of heath, some parts whins, with a profusion of those grasses indigenous to such soils.

The ground was all well drained previous to planting, and all well fenced, partly with turf dykes, partly with wire and posts, and partly with wooden paling and posts.

In consequence of the long interval between commencing to plant and finishing it, difference of quality of soil and exposure, there is a corresponding difference in growth all over the plantation. In some parts the trees are over 15 feet high, while in others they are scarcely as many inches.

With such an extent of plantation before him the writer had to consider well what course to pursue with the thinning. He saw that to allow such an extensive plantation as that to grow to any considerable height before thinning would be attended with disastrous consequences; and in order to avoid this, he commenced work on all parts where the trees had attained 6 to 8 feet high, and cleared openings or shooting roads, as they are termed. The roads are laid off 100 yards apart each way, thus dividing the whole plantation into squares containing 10,000 square yards each. The roading was done by contract, the open space specified to be 16 feet wide, and all trees, heath, and whins to be cleared off and thrown clear of the sides at least 3 feet. The trees, heath, and whins all to be kept separate, and laid in small heaps amongst the growing trees in such a manner as not to injure any of them.

The trees and whins to be cut level with the natural surface of the ground, and all heath and other herbage to be mown with

the whin scythe and raked off. The work of roading was let in two separate contracts. By the one the work was done at three farthings per lineal yard, and by the other at one penny per yard. At the above rates the contractors earned for themselves, and those working under them, fair wages, say from 18s. to 20s. per week. The heath, whins, and thinnings were sought after by the tenant farmers and peasantry in the district, and carted off by them without making any charge. Having first determined upon the base line as the starting-point, the whole subsequent operations were carried on by means of the cross staff and poles used in land measuring. In the midst of a dense forest or large plantation like this, it is impossible to carry the lines straight and parallel without some squaring instrument, of which the cross-staff is the most convenient for practical use amongst common labourers. The reasons why it is desirable to have the roading done before thinning is commenced, is in order to guide the latter operations. Any one practically acquainted with thinning young plantations knows the unpleasant effects of a bewildering and interminable thicket, and the confinement and want of air and sunshine. I conclude that ten men do as much work in one month in a well-roaded and properly laid off plantation as they would do in six weeks in one without roads or openings. Another reason for making the roads the first work in connection with thinning is to afford facilities to the keepers for killing rabbits and game. I recommend making all the roads straight and parallel with each other, as far at least as the nature of the ground will admit. The advantages of the parallel straight roads are also experienced during the cover shooting, by affording the beaters the opportunity of coming into and keeping line at the end of every 100 yards, and the roads themselves determine the distances at which the guns are to be placed. Straight and parallel lines of roads are recommended, but cannot always be carried out in practice. Roads leading up hill must of course be curved or serpentine, and as no road can be led through a morass or swamp, or over a precipice, all such places must be avoided, and this cannot be done without deranging the plan of squares and straight lines. My plan is, when a deviation of road is unavoidable, to confine it to the one particular road, and not derange the general lines of all the roads.

The work of thinning is proceeded with according to the size of the trees ; and here special attention should be paid to their height. As a rule I thin when the remaining crop stands 6 to 8 feet high, at which period they should be about 8 feet apart, or say 700 trees per acre. I know this practice is called in question by some, and condemned by others, and few approve or practise it. On these and other accounts I am all the more

desirous of stating reasons, and giving my experience of the matter. First, an active man with a proper hand-bill (not hedge-bill), which is the only proper implement I know of for such work, will thin an acre in two days, and this represents six shillings per acre added to the original expenditure of forming the plantation, for until such time as actual income is derived from the plantation, the whole expenditure must be charged against it. The thinnings at this stage I put no money value upon. They are mostly collected and carted away by the tenantry and others; but the cost and labour of collecting and clearing are so great, that no money is charged for them except a small sum for such as are on the margin of the plantation, and convenient to clear. The second reason for thinning at this early period is, in order to give the remaining crop full freedom and liberty to develop their lower side branches. It is those branches situated upon the lower part of the stem of the tree that supplies food and nourishment to the roots, and unless they are preserved vital at this critical period of the tree's existence, it very soon ceases to develop itself and make wood. In fact, it ceases to grow to anything like satisfaction at that very period when it should be making wood faster than at any other period of its history. If only it could be kept in mind that the loss of every lower branch of a young tree is just a corresponding loss of roots, and as the one suffers so does the other, it would be a good and profitable thing for woodland proprietors.

To the preservation of the lower branches of the celebrated larch forests of the Duke of Athole, more than anything else, may be attributed their successful growth. The larch there were planted 6 feet apart, and that distance, admitting that all the trees grew, allowed all the lower branches to grow 3 feet in length all round; but as many of them would no doubt decay, and from accidents and other causes perish, many of the trees would thereby produce their lower branches twice that length, hence the unparalleled results of the growth of the larch in these forests.

Having witnessed so much injury inflicted upon young plantations, and some entirely ruined, by the lower branches being interfered with at a stage of growth too early, I would recommend in the strongest possible terms, the special attention of all who have the management of plantations to this particular aspect of the subject. It is often asked what rule can be given, and how it may be known when either individual trees or plantations have the exact and proper quantity of branches upon them. The rule for this is, as far as any rule can be given, to maintain a due proportion of girth to the height of the tree, and these proportions are girth in inches to feet in height. For

example, a tree 12 feet high, should girth a little above the swell of the root, 12 inches; a tree 24 feet high, 24 inches, and so on up to 30 or 35 feet in height, to a corresponding number of inches in girth. When trees attain the above height, thinning should be entirely discontinued, and frequently it should not be prolonged after the trees are from 20 to 25 feet in height, but allow the plantation to grow undisturbed (except by cutting down dead or decaying trees) till it is ripe for cutting down and clearing the ground.

That there is a danger of old trees having too many, as well as too few branches, I fully admit; but there is no danger of *young trees* having too many, and if the rule given should be observed, there will be no superfluity of branches at any time, for if the proportional girth is too great, it can soon (if their are sufficient trees upon the ground) be reduced.

Having found out by careful inspection, that a well proportioned, and properly balanced tree measures as many feet in height as it girths in inches, I was further anxious to know what proportional weight the branches of such trees bore to the stem on which they grew, and in order to ascertain this, I cut down, in the process of thinning, some specimen trees of the following species, and after carefully weighing them, I found the following results :—

Species of Tree.	Age.	Height.	Girth.	Weight of Stem.	Weight of Branches.
		ft. in.	inches.	lbs.	st. lbs. oz.
Larch. . . .	19	27 0	20	91	1 11 0
do. . . .	10	13 6	14	23	1 4 0
do. . . .	7	4 4	$3\frac{3}{4}$	$1\frac{1}{2}$	0 0 12
Norway Spruce.	10	10 6	8	12	0 2 0
do. . . .	7	4 3	5	$2\frac{1}{4}$	0 2 0
do. . . .	7	4 5	$5\frac{1}{4}$	2	0 1 4
Scots Pine.	36	27 5	30	224	12 3 8
do. . . .	26	20 $4\frac{1}{2}$	$22\frac{3}{4}$	$89\frac{1}{4}$	6 5 0
do. . . .	20	15 $5\frac{1}{2}$	13	27	1 0 0

The height and girth in the above table are not exactly proportional, as it is very difficult in making a selection to find them so, but the approximation is sufficiently near for the purpose of showing the requirements of practical forestry according to my definition. The form or outline of the tree up to that period when thinning should be discontinued should be conical or tapering, both in the stem and general form of the tree. After thinning is discontinued the shape of the tree alters, both in the stem and branches; the latter wither and fall off, till only the top is covered, and the former gradually

changes from a cone to a cylinder. The cause of the latter change is in the increase of woody deposit near to the live branches, and decrease of it when the branches have withered and fallen off. During this stage of growth, on dissecting a tree, it is found that the zones of wood near the vital branches are much thicker than at a distance from them, and the further distant the thinner they are. Every possible effort should be made in the thinning of plantations to preserve the proper quantity of live branches upon each individual tree, for if once the vitality is destroyed the best future skill will be defective in restoring it. Another reason for early thinning is in order not at any time to check the growth of the trees, for it must always be borne in mind that the immediate effect of thinning is to check the growth of the standing trees, and this is done in at least two different ways.

It is very consoling to be told that if thinning is done *gently*, no evils will result from it. The most gentle mode of thinning that can be practised is to cut down one tree that stands too close to another. If many such trees are cut, the thinning may be termed severe; and if only a few are cut, it may be termed gentle. With words and terms, however, we may do as we please, but with the effects produced upon the standing tree, by removing one that stood close by it, and for whose sake it was cut down, we have some inquiries to make. When two trees have grown up side by side, for many, or it may be only a few years, they have formed such an affinity for each other that separation becomes a painful ordeal, so far as trees can be supposed to sympathise with, or feel, which for my part I do not believe in to the same extent as some do. Whether trees are affected through feelings or not is of little importance, since it is certain they are influenced in two other ways at least—namely, mechanically and chemically. That thinning injuriously affects trees both ways there is little or no doubt; and we shall first see how they are injured mechanically. When two trees grow near each other the branches on the confronting sides are less developed than on the opposite sides, and the roots underneath are developed in a corresponding manner; and if one of the trees is removed by thinning, the whole of the weak side of the remaining tree is exposed suddenly, and the wind acting upon it strains the tender weak roots to such an extent as often to uproot the tree altogether. But apart from actually uprooting and blowing over the tree, the roots are strained and fractured so severely that they lose their vitality. Any injury inflicted upon resinous trees, whether upon branch, stem, or root, is succeeded by an accumulation of rosin, and this, when it occurs to the roots, is fatal to them, as it obstructs the sap vessels and stops the circulation.

From observing the sickly aspect of a very extensive plantation after being thinned, and being called upon to assign a cause for it, which I was at the time unable to do, I turned my attention exclusively to the subject, and, after much labour, concluded I had solved the problem. The plantation consisted principally of Scots pine, with a mixture of larch and spruce and some hardwoods.

All species of trees did not present the same sickly appearance, nor did the same species on all soils.

The Scots pine was of all others the most sickly, especially upon the hard gravelly soils, and the larch least affected of any. Of all forest trees the Scots pine is the most impatient of any artificial interference, and suffers more from thinning than any other species. In this case, after thinning the trees lost their natural dark-green colour, and assumed a faint light-green. The leaves became shorter, and presented a clustered appearance. Some foresters, on giving their opinion upon it, said it required more thinning; that the crop was too great for the poor gravelly soil to bear. Some thought it blighted by some atmospherical influence, and others said it had attained maturity, and ought to be cut down.

After weighing all arguments, and duly examining the whole case, I came to the conclusion that the thinning, and thinning alone, had done the mischief. From a very wonderful provision in nature, the branches of a tree are so spread out as to shade the surface of the ground underneath which the delicate tender roots are spread, and thus keep them uniformly cool, and never at any time scorched or unduly heated by the direct rays of the sun. A plantation, therefore, like that under consideration, which had grown up till about forty years old without ever receiving a regular thinning, may well be understood to have so far adapted itself to its circumstances as to be seriously and injuriously affected by any change such as thinning. The trees —including stem, branch, and root—were what may be termed acclimatised, or rather habituated, and therefore thinning produced a change upon them equivalent to removal to a different soil and climate.

There is much said about acclimatising of plants, which applies only to that part above ground, but there is little or nothing said about the roots of the plants, although the latter are equally as important as the former.

Now, if a pine or fir plantation such as this, grown upon a dry gravelly soil, with the roots extended and ramified all over, and within an inch of the surface of the ground, is it either unreasonable, strange, or unlikely, that, when a sudden opening is made by cutting one or more trees, and letting in a stream of sunny rays to heat or scorch the delicate, tender, sensitive roots, so

long nursed, protected, and shaded under a canopy of branches—is it strange, I would again ask, that a change should take place with the roots of the trees, or that the heat of the sun should crystalize the fluids in the roots, and stop the flow of sap which was wont to nourish the tree? To this chemical change in the roots I attribute the sickly appearance referred to.

Another Scots fir plantation was thinned at about thirty-five years' growth, and had not been thinned during the preceding fifteen years. After thinning it became sickly and death-like, and but for the important place it occupied in the landscape would have been all cut down. It however was allowed to stand, and after the fourth or fifth year began to assume its natural colour, and is now in a fair state of health.

After a few years the trees usually recover, as the result of having made new roots suited to their new condition of life; but while some recover, others go back and perish altogether.

From the foregoing results, it must appear obvious that thinning is a very delicate and precarious operation, and is attended with much danger and risk to a crop of trees. If thinning could be entirely dispensed with, so much the better, and in the case of natural forests, where no artificial thinning has ever taken place, there are to be found many hundreds of acres of wood which no artificial forest or plantation can compare with in point of value. Any one who has examined the forests on Deeside, on Balmoral, Invercauld, and Mar Estates, or Rothiemurchus, Glenmore, and Abernethy, on Speyside, and many others both at home and abroad, will support that testimony. One piece of a few acres on Rothiemurchus estate is worthy of special notice. When I examined it a few years ago, the trees stood on an average 9 feet apart—some of them as wide as 15 feet, and others as close as 2 feet. The market value of it per acre at the time I saw it, allowing the trees to be all sound—which I am certain they were not—was at least £300 per acre. The ground itself is the poorest possible—a light, sandy gravel, with a crisp dry herbage of heath and moss, certainly not worth over 1s. 6d. per acre per annum for grazing purposes.

The question here arises, How are plantations to be managed that have been so thickly planted as to require thinning to prevent the trees from growing up disproportionately small? The answer is, thin early enough, and complete the operation before the side branches touch each other, and before any of them decay. This is advisable, not only for the preservation of the branches themselves, but in order that no unfavourable change be produced upon the roots of the trees, by admitting a degree of heat and air amongst them to which they have not been accustomed, and which they cannot endure.

In all forest operations by far too little attention is paid to

the roots of the trees. They are often planted in soil so saturated with water that no air can penetrate it, and reach the rootlets—hence the lingering and sickly state the trees remain in for years after being planted; and it is only after they grow to such a height that the action of the wind upon the trees shakes and loosens the soil that they begin to grow freely.

Most plantations under thirty years old may be benefited by thinning if the trees have sufficient branches; but where they have stood so closely together as to destroy their vitality to two-thirds their entire height all hopes of restoring them is at an end, and if any thinning is done in such cases it does not improve but injure the crop, by retarding its growth.

All thinning, I would again repeat, should be commenced before the side branches touch each other, and continued till the trees stand about 8 feet apart, after which they may very safely be handed over to Nature to perfect and complete their growth, the forester meanwhile only to cut and remove dead or sickly trees till the crop is ripe, when it should be cut, cleared, and the ground replanted.

All that has previously been said about thinning applies only to pine and fir plantations; and now a few words about hardwoods.

I have an extensive hardwood plantation under my care which had never been thinned up to twenty years old. It consists of oak, ash, elm, beech, sycamore, lime, &c. At the age of twenty it received a moderate thinning, and from that time to the present (twenty-five years) it has received every possible attention. Some of the trees are over 1 foot diameter, but the greater part are not quite 6 inches, and some not even 4. The soil is good, chiefly of a loamy nature, and a good depth.

The remarkable disparity of growth amongst the trees impresses one with a desire to know the reason why some are so large and others so small, being all of the same age and grown on the some soil. The explanation is simply this,—Those that were confined, and thereby deprived of their lower branches, are the small ones; while those that had most room are the largest.

It is a common impression that hard wooded trees, though denuded of their branches when young, will recover them after being thinned. That such is not the case I have ample proof of; for here there are hundreds of trees as bare as poles, with only a tuft of branches on the top, which have had ample room for many years to develop their side branches, had it been in the order of Nature for them to do so. Some trees—as the oak—do make an effort to reproduce their lateral branches, but when the effort at all succeeds it is at the sacrifice of the top growth, so that what is gained on the one hand is lost on the other. It is very difficult to know how to treat a plantation

successfully that has once been neglected in thinning. Cutting down and allowing a new crop to grow from the stools is sometimes recommended; but this plan is attended with at least one very serious objection—namely, the circumstance that the scion springing from an old stool produces a tree in character, form, and habit exactly like the parent from which it springs. A dwarfed and stunted tree produces one dwarfed and stunted, and so on. Since, then, so very little can practically be done to recover neglected plantations, the greater is the necessity for preventing them from going wrong.

To all rules there are exceptions, and to this the larch appears to be so; for, of all others, the larch gains most by thinning and suffers least from it. It is very impatient of confinement, and enjoys freedom and liberty, although they come even late. On bare pole-like trees I have seen lateral branches formed and developed beyond anything I have witnessed in any other forest tree. Unless the trees are sound and healthy, however, no lateral growth will take place by thinning. There is something, also, very remarkable about its roots; I know some old stools still vital from which the trees were cut more than twenty years ago. How they continue vital and yet produce no shoots is a profound mystery, and all the more so that no other stools remain in the same state.

The system of thinning young plantations for profit is very objectionable. Not that there is any wrong in disposing of the thinnings to the best advantage; but the profits spoken of as derived from thinnings have done much to mislead proprietors, and induce them to injure, if not ruin, their woodlands. I saw a plantation lately which had been thinned for pit-props, and it was sad to see most of the fine grown and best proportioned trees cut down, and the coarse and weakly ones left as the crop, many of the latter so weakly that they could not sustain their own weight. A report set forth this plantation as an example of profit, and showed that it yielded, as thinnings in a given time, from L.8 to L.10 per acre. The same report should have stated how much such thinnings had reduced the value of the plantation.

On some estates a large revenue is derived from what are termed thinnings, although the plantations are so thin already that they are suffering from it. I know young Scots pine plantations being thinned containing only 300 trees per acre, and some also containing only half that number. Thinning is a very general term, and is understood and practised very differently. Cutting down the tender sapling as a weed of a few years' growth is termed thinning, and the operation of felling *all but* the last tree of the matured old forest is known by the same term. The two greatest errors amongst foresters are—being too late in commencing to thin, and continuing the operation too

long. It does much good if done early, and equally much harm if done late.

"The most valuable crop of oak timber I ever saw," says Mr J. S., an extensive timber-merchant, "was upon the Duke of Devonshire's property in that county, when the trees stood from 6 to 8 feet apart." The best I ever saw was a few acres of Scots pine on Rothiemurchus estate, Strathspey, when the trees stood from 2 feet to 15 feet apart.

ON NATURAL COPPICE WOOD, OF OTHER SPECIES THAN OAK.

By Andrew Gilchrist, Urie, Stonehaven.

[*Premium—Five Sovereigns.*]

At the present day, notwithstanding that more attention is being paid, alike by proprietor and forester, to the science and practice of arboriculture than has ever been, there is still room for further improvements in the economic management of plantations, ere they become as remunerative as might be reasonably expected, considering the skill and intelligence that is being brought to bear upon them.

A more extended and judicious system of conserving and rearing natural coppice wood in plantations, is, we think, one of the means whereby our Scottish woodlands may be brought to yield a better return for the land occupied. At present there is a great extent, probably, on an average, about a fourth part of the woodlands of Scotland, that yield little or no return per acre.

This is not so much owing to mismanagement as to local peculiarities, such as, for instance, a portion of an enclosure, after say twenty-five years growth, owing to something deficient in the soil, or peculiar in the situation, often yields a crop of three-fourths less value than the rest of the plantation. In cases of this kind, instead of allowing the whole extent of a plantation to grow to the age of full sized timber, it would often considerably increase the returns per acre to take two crops of coppice instead of one very inferior crop of aged timber. We might mention several examples of this kind that have come under our own observation when clearing plantations. For example, in clearing a 50 acre enclosure in the county of Forfar, the crop of which consisted for the most part of larches and Scots fir, we found about two acres of damp ground with a partial crop of birches. Apparently only about one-half of the trees had been planted at the time the plantation was formed; the others were about twenty years old, and had grown from seed. It was evident that during the last twenty years the planted birches had not been making so much progress in their growth as they

had previously been doing; as a whole they were not so saleable, nor so sound as the younger trees were. The actual produce of these two acres was 25 tons of birch at 12s. per ton, equal to L.7 10s. per acre. The seedling trees were doubtless the most valuable. They were all quite sound and saleable, but not a few of the others were dry and slightly affected with rot, and it took a greater quantity of them to make a ton. A partial examination of these two kinds of birches was sufficient to convince any practical man that these two acres might have yielded more than the double of what they did. Had they been cut over after about twenty years growth, at that age they would have been quite as suitable for bobbin wood as they were at forty years. If they had been thus allowed to grow up as a natural coppice, the second crop would have been closer, and, doubtless, altogether much better than the first; but even though it had only been the same, it is not too much to say that under judicious management there might have been L.15 per acre for the forty years instead of only L.7 10s.

Another portion of damp ground in this same plantation (fully two acres in extent) had been left undrained and planted with larches, the actual value of which at the time of cutting was not more than L.12 per acre, while the realized value of the larches and Scots firs on the suitable soil was L.42 per acre, showing a loss of L.30 to the proprietor. Now, had this portion of damp ground been planted with birch and alders, and treated as natural coppice, the return per acre for the forty years would have been at least L.30.

On most estates there are several acres of woodland very similar to the above examples that might be most judiciously turned to a better account by converting them into a natural coppice. For instance, there are in some enclosures small portions of damp or boggy land on which trees such as the birch and alder have been planted and are allowed to grow for sixty or more years, simply because the trees on the dry soil are not cut down. It is an admitted fact by all practical men, that alder and birch grow most rapidly during the first twenty years of their growth, and that, in not a few instances, they begin to get dry and affected with rot after about thirty years' growth. Indeed, in cutting over old plantations, as well as in the periodical thinning, we have frequently cut down alders and birches that were comparatively worthless, simply because they were left too long. All this clearly shows that in many instances it would be more profitable to take two crops instead of one, even though there was no demand in the district but for firewood.

There are also many precipitous glens, by the sides of large and small streams, that are almost inaccessible, and where the

expense of removing large sized and full grown timber is almost equal to its value. In such places a crop of coppice wood, consisting of sycamore or ash, would generally grow very rapidly, and could be worked and removed at a great deal less expense than full grown timber. Most of the counties of Scotland are intersected with numerous streams, some of which have their banks clothed with trees, but in many cases these are very stunted and unhealthy. Owing to the banks being narrow and steep, the trees are often liable to be partly submerged at the time of a spate. And the small extent of ground that is found to be available for planting is often not considered to be worth the expense of a protecting fence. Under these, and similar circumstances, natural coppice would be a much more remunerative crop than the trees that are generally grown on these places.

In the year 1859 we cleared a crop of natural coppice from the banks of the Nethen and one of its tributaries in the county of Lanark; this crop consisted for the most part of alder and birch, and was sold for the manufacture of gunpowder at 18s. per ton peeled. They had grown about twenty-five years, and the estimated yield per acre was about L.16. The greater part of this coppice was cut from narrow and steep banks that were not considered worth the cost of a protecting fence, and they had apparently never received any thinning, so that there had been no expense whatever connected with the growth of this crop. The ground occupied could scarcely be considered worth any rent; but supposing we value it at 5s. per acre, and allow 35s. for clearing the crop, there is still a clear profit of L.8. Now it is on these portions of peculiarly situated soils that are not properly suited for the rearing of full sized trees, and that, except for the growth of natural coppice, would be quite unproductive, that we consider would be well worth the expense of being planted with those trees that are best suited for growing as a coppice. Narrow banks and slopes of streams are often left unplanted because the expense of thoroughly enclosing the small extent of ground would be greater than the profit to be derived from the crop. But, except when newly planted, or when the crop is cut over and the shoots young and tender, natural coppice (especially birch and alder) does not require great protection, and in many instances, both at the time of planting and at each periodical cutting, the fencing might be done at small cost, by arranging the prunings of trees or thorn hedges in a form of a dead hedge. A temporary protection of this kind will be found to last for a few years till the young growths are to a certain extent beyond the reach of serious damage from animals. There are other comparatively inexpensive methods of fencing, such as the turf dyke and ditch, that might afford a permanent protection; but they need not to be detailed here.

On various estates we have observed some deciduous plantations,especially when planted in the form of clumps and belts for shelter on exposed situations, and thinnish soils where the trees make little progress in their growth after they rise above the natural shelter of the district. We have frequently valued such trees, and found that on an average they were not worth more than 1s. 3d. per tree, or L.15, 2s. 6d. per acre, even after more than forty years' growth, while in the same district, with a similar soil, we have found an acre of coppice, twenty years old, to yield 20 tons at 14s. per ton, thus being a balance of L.13 per acre in favour of two crops of coppice, which conclusively proves that not a few of these ill-thriven plantations might be profitably converted into natural coppice.

We wish it to be distinctly understood that we are not recommending the planting of ground, or even the converting of plantations into a natural coppice where the soil is suited for the growth of larch, Scots, or spruce firs. Our remarks apply more to those portions of woodland that are naturally not capable of growing so profitably full sized timber as natural coppice. To carry out what we recommend, the essential materials are generally already partly in existence, and all that is needed is to adopt a judicious system of conservation.

Having thus shortly mentioned some of the situations where natural coppice may be profitably grown, we will now notice the trees that are the best suited for its production. The birch is unquestionably one of the most suitable trees. It thrives on a great variety of soils and situations, even on very damp, cold, bleak exposures; it grows faster than any other tree for the first twenty years of its growth, and numerous shoots spring freely from the stools after the trees are cut. In almost every district of Scotland there is always a good demand for birch, for the manufacture of gunpowder, clogs, and bobbin-wood, &c. In Glasgow the thinnings of birch sell well as wands, and rods for crate making, and the prunings always meet with a ready sale for besoms.

The alder is another tree well adapted for coppice wood, for which there is always a ready sale for purposes similar to the birch. It grows rapidly as a coppice, and sends out shoots freely from old stools, even though in very damp indifferent soil. It is not such a hardy and profitable tree as the birch for dry thin soils and exposed situations, but it is superior for marshy gulleys that cannot be properly drained. When coppice plantations are to be planted at first, or even in filling up blanks in older plantations, we would strongly recommend the planting of the silver alder, *Alnus incana*, in preference to the common variety, *Alnus glutinosa*, as the former grows much faster, and continues to thrive to a greater age. After being five or six years planted, it

sends out large numbers of suckers, not only from the collar of the tree, but they also spring up at a distance of several feet from the stem; and these can all be turned to account, either by encouraging them to grow up as additional coppice shoots, or transplanting them when young. The alder is very suitable for planting as a coppice on the marshy banks of streams, as it grows freely, even though its roots on the one side are partly covered with water; nor does it seem to suffer so much from the effects of high floods as the ash, elm, and other trees do.

The sycamore is also a most useful tree for the production of natural coppice. It grows freely on almost any soil, if not too damp, but though very impatient of stagnant water in the soil, it thrives rapidly on the drier banks of streams, even though part of the roots are almost constantly among the running water. After being cut over, shoots grow freely from the stools, and in many plantations young trees spring up and grow rapidly from fallen seeds. At present there is a growing demand for all sizes of plane tree, from two inches diameter upwards, chiefly for the manufacture of bobbins and rollers.

The Norway maple is also a profitable coppice tree, being very similar in its habits and uses to the sycamore.

The ash is beyond dispute one of the most profitable coppice trees in Scotland; it grows freely and rapidly from stools in dampish glens and sheltered situations, and is always in good demand at all sizes. When young it sells well as wands and rods for the manufacture of strong crates; its older growths meet with a ready sale for cart and barrow slots, and for handle-wood. In the county of Dumbarton we have cut down thinnings from a ten year old ash coppice with from three to six feet of the root cuts quite suitable for handle-wood, and sold these thinnings at 16s. per ton lying on the ground.

The elm is very similar to the ash, both in regard to its rate of growth, soils, and situations on which it thrives, and also as to the value of its thinnings, but it is slightly inferior in its value as a full grown crop, owing chiefly to the preference that is invariably given to the ash for making handles, but the elm is equally useful for turnery purposes, cart and barrow framing, &c.

The Spanish chestnut on a loamy soil and sheltered situation is another useful coppice tree; shoots grow up rapidly from its stools, and sell well for wands, hoops, and crate wood; older growths sell well for turning purposes.

The horse chestnut, though it sends up shoots freely, is in Scotland not considered to be a very profitable coppice tree. Its wood being wanting in elasticity, the thinnings are unsaleable until they are size for strong crates, or for turners and firewood.

The lime tree is also suitable as a coppice tree, but is much inferior to the ash and elm, both in regard to profit and the pur-

poses to which its wood can be applied; still it always meets with a ready sale for turning purposes. The same remarks may be applied to the hornbeam, the only difference being that it grows on a poorer soil and its shoots are rather more elastic, consequently, its thinnings sell better as wands and rods.

The beech, compared with the foregoing trees, is at best somewhat tardy in sending up shoots from its stools, otherwise it is very similar to the hornbeam.

The wild cherry makes a good coppice tree; it grows freely on thin soils, and produces numerous shoots from its stools, and propagates itself from seeds. The shoots are tough, and quite saleable at all ages, for purposes similar to the birch.

The mountain ash is a first-class coppice tree for the production of wands and small crate wood; it is very hardy, and grows freely on very poor soils and exposed situations, and is very suitable for growing on rocky shelves of glens.

The hazel is also a hardy reproductive plant, very similer in almost every respect to the mountain ash. Both trees being mainly adapted for the production of the smaller class of coppice wood, and are consequently most suitable for being planted as intermediate stools among stronger growing plants, such as ash, elm, and sycamore. These trees are also the most profitable and vigorous growing plants that can be planted to produce a crop of underwood in hardwood plantations.

Several of the poplars, such as *P. nigra, P. alba, P. tremula,* grow vigorously as coppice wood, and the shoots are very saleable for the manufacture of hampers and crates. If the situation is somewhat sheltered, such as a hollow, dampish part of a plantation, they are by no means particular as to quality of soil, and are very profitable as a coppice, especially when grown in clumps by themselves. One of the largest proprietors in Kincardineshire has planted about a million of *P. nigra* at the foot of the Grampians, with the intention, we understand, of converting them into a coppice for the production of wood to be manufactured into pulp for paper-making. This is a new branch of industry that deserves to be carefully and impartially inquired into, and the results brought under the notice of landed proprietors before they are recommended to plant poplars indiscriminately on land that might be very profitably occupied with larch and Scots firs.

The above list comprises most of the trees that are usually grown as natural coppice in Scotland, and in regard to their suitableness for the various soils and situations they may be classed as follows :—

1*st*, For high lying and exposed situations, with a thin soil, the best trees are the birch, hazel, and mountain ash. The birches would constitute the main crop, and should be planted

about eight feet apart, and the intermediate spaces made up with hazel and mountain ash to four feet over all.

2*d*, On similar situations but with a damp boggy soil, as also on all marshy undrained portions of land, the alder should be planted by itself.

3*d*, On less exposed parts, with a deeper and better quality of soil, the ash, sycamore, and hornbeam may be planted at nine feet apart as the main crop, and the ground filled up with mountain ash or hazel to about four and a half feet apart.

4*th*, Peat moss, if properly drained, may be profitably planted with the common ash, at ten feet apart as the permanent crop, with birch or mountain ash as nurses. But on imperfectly drained moss the birch and alder are the most profitable trees.

5*th*, Poplars, chestnuts, elm, and lime trees are best suited for good deep soils with a considerable shelter, such as the hollow parts of plantation ground; there they may be planted at ten feet apart, with the mountain ash and hazel between.

In forming coppice plantations some recommend the planting of larches as nurses, but after considerable experience and observation we are inclined to think that this is not a judicious practice, because the trees that are to constitute the crop of coppice are liable to be overdrawn, and this has a great tendency to prevent them from becoming so stout at the collar as they ought to be, and always are when grown by themselves.

In planting trees for a permanent crop of coppice wood, it is very desirable, as far as possible, to have each variety planted in a clump by itself; when this is done, it is generally found that the crop is more remunerative, and grows up more regularly.

When rearing young trees for the purpose of converting them into a coppice wood, the great aim should be to encourage them to become branchy and stout in the stem, with a good diameter at the base, which insures a large-sized healthy stool for the growth of the subsequent crops.

The hazel and mountain ash should be cut over as soon as they are seen to be sufficiently strong for being sold as wands or rods, which they will be after from six to ten years' growth, according to soil and situation; while the other sorts will generally take from twelve to eighteen years to attain a diameter of 4 to 6 inches at the base, which is the size they ought to be before they are cut over for the first time. At the first and at all subsequent cuttings, the stools should be made as low as possible, and have a surface so sufficiently smooth and convex as to entirely prevent water from standing on them.

After the first crop has been cut over, the shoots that spring from the stools should be thinned out when they have grown from two or three seasons, leaving from six to eight of the best on each stool; a preference should always be given to those shoots

that spring out from the lower parts of the stool, as these generally send out individual roots into the soil, which greatly encourages the growth of the shoot, as well as the extension of the stools. The second thinning should be done about six or eight years after this, and at this time all hazel and mountain ash shoots should be clean cut over, pruned, and taken up along with all the other thinnings that are found suitable for being sold as wands and rods. These are tied up into bundles of 100 each, and sold for the manufacture of crates and hampers. At this thinning, from two to three shoots will be found sufficient to leave on each stool, and in most cases it will generally be found that no further thinning will be necessary.

Except in the case of simply foreshortening any very strong side branch that inclines to spread out and overhang any of the no pruning in the rearing of natural coppice is necessary shoots.

Regarding the age at which natural coppice should be cut over, no *absolute* rule can be laid down, as experience proves that it can only be fairly determined from an intimate acquaintance with local peculiarities, such as the size and kind of wood most in demand, varieties of trees that constitute the crop, nature of soil, and situation.

For example, we have found a crop consisting chiefly of ash, that, owing to the demand in the district for rods and crate wood, could be most profitably cut over at about 12 years of age; while, in the very same plantation, there were several clumps of alders and birch that would, in about eight years more, be well adapted for clog and turners' wood, for which there was also a good demand in the district. Consequently, we apportioned the plantation, and cut over the clump of ashes; and as the alders and birch were growing vigorously, we allowed them to remain till they were a suitable size. But this can only be done where a crop consists for the most part of one sort of trees. It would never do to carry this out with a few stools in a promiscuous plantation.

The crop should always be cut over as soon as a want of vigour is apparent in the annual growths, as it considerably impairs the vitality of the stools when the shoots are left till they get into a stunted state of growth.

In managing coppice woods, they should always be apportioned in accordance with the extent on the estate, and the sorts of trees on each portion treated and cut over successively. This systematic method of rearing is by far the most profitable, as it equalises the labour and cost of rearing as well as the return from the plantation; and besides it may, and often does to a certain extent, control the supply and demand in the district, which helps to maintain a regular price.

Regarding the cutting and disposal of natural coppice, little

can be said here, as no absolute method can be laid down suitable for every district.

Large plantations are frequently divided into lots and sold by auction or by private tender. In the counties of Argyll, Dumbarton, and Stirling there are merchants who purchase both the thinnings and the entire crop by the acre or by the lot, and cut and carry the whole to the market at their own expense; while others purchase the thinnings after they have been cut and assorted by the proprietor's men. On some estates the thinning and final clearing is cut, assorted, and sent direct to the market by the proprietor's men, or sold after being cut over. After noticing and comparing several instances where the work was done each way, we would recommend the system of allowing the purchaser to perform all the work, as it is generally the most profitable for the proprietor. No doubt there are some exceptional cases where a really energetic forester, with a thorough system of forest management, and perhaps a favourable market, can as economically manage the cutting and disposal as a wood merchant can; but as a rule, the latter have the advantage of efficient men who are in almost daily practice, and are consequently able to do the necessary work at less cost. And besides, the merchant not unfrequently lets the work by contract to practised men.

Whatever method is adopted, the strictest attention should be paid to have the wood carefully cut, so as to leave the stools *smooth and slightly convexed;* and as severe frosts are sometimes injurious to newly cut stools, the cutting over should not, if possible, be begun till the end of February, and finished (the plantation being thoroughly cleared of prunings and rubbish) by the middle of April. Immediately after this, if there are drains they should be cleaned, and the fences sufficiently repaired to keep out cattle.

It is of comparatively little importance to state the returns that may be expected from an acre of natural coppice, as no two districts are exactly similar in regard to soil, situation, and demand; consequently the realised value of an acre in the one district would be often fallacious in another. The profitable growth of coppice, like all other forest produce, is to a considerable extent controlled by circumstances; consequently many of the statements that are given of its value per acre have a tendency to mislead, owing to the crop that is valued being grown under exceptionally favourable circumstances or the reverse. For example, we have seen in the western district of Scotland a two-year old coppice fully as strong as one of four years' growth in one of the north-eastern counties. After considerable experience in the thinning of coppice, we think that, unless in districts that are unfavourably situated in regard to a market, the thinnings will generally be found to pay the cost of rearing. In such

districts we have seen an acre of mixed coppice, after 20 years' growth, not yield more than L.8 per acre; while on a district more favourably situated, both in regard to soil and market, a similar crop has, at the same age, brought L.14 per acre. And, again, we have seen L.30 realised for a crop of ash 18 years old, and L.25 per acre for a 20 years' old crop of birch and alder, both in districts very favourably situated for the growth and disposal of coppice. But as these statements may be considered of comparatively little value, we think it better to state the current prices of coppice produce. In Glasgow, where there is the best and most regular demand, both for thinnings and for full-grown coppice, the prices for 5 to 7 feet gardeners' wands, 10s. to 14s. per 1200; 7 feet upwards foresters' wands, not strong enough for ribs, 21s. to 25s. per 1200; 9 feet long, ½ inch through at that length, 30s. to 45s. per 1200; crate wood, 22s. 6d. to 25s. per ton. In Paisley, alder suitable for bobbin wood brings from 20s. to 24s. per ton; birch, from 22s. to 26s. per ton; sycamore, from 18s. to 20s. per ton; beech and hornbeam from 14s. to 18s. per ton.

In Aberdeen there is a fair demand for various sorts of coppice, at from 18s. to 20s. per ton. In Arbroath there is always a good demand for coppice, especially for birch and sycamore, at from 18s. to 25s. per ton; and the latter tree, when 7 inches through at any length, readily brings 9d. per lineal foot, lying in the plantation 40 miles from the manufactory.

At Edinburgh, birch and alder brings from 15s. to 20s. per ton; ash and elm from 14s. to 18s. per ton.

Alder and birch, when sold for powder making, has generally to be peeled; the bark of the alder is not saleable, but the birch bark sells at from 35s. to 50s. per ton, which in most cases more than pays the cost of cutting and peeling the trees.

It is customary in many places to grow some timber trees along with the coppice wood, but this is a *great mistake*, as they through time spread out and overhang the coppice, and ultimately cause the stools to become feeble and to die out. The number of trees per acre should be about ten, *and at most not above twenty*, and even this number should, by a regular and early system of foreshortening, be kept from becoming so wide-spread as to kill any of the stools.

Natural coppice is on some estates grown as underwood in hardwood plantations, but except in very favourably situated districts it does not generally pay. And when there is a full and rapid growing crop of trees on the ground, it is to a certain extent injurious to their growth, especially when thinning is neglected and the underwood allowed to grow up and contend with the trees for space. Some foresters do everything in their power to discourage the growth of underwood, and even go the

length of affirming that it so seriously affects the growth of the timber crop that the better plan is to grub out the trees that are periodically thinned out, rather than leave them to send up coppice shoots; and allege that the benefits to the timber crop by the removal of the stools more than pays the expense of grubbing. While not recommending the growth of underwood as a *generally remunerative crop*, we are inclined to doubt if it is not much more profitable to allow the stools to grow than to grub them out. Where there is a good market for the sale of wands and rods, such as, for example, in the counties of Stirling and Dumbarton, the trees should be kept *much thinner on the ground*, and the stools, if suitable, allowed to send up shoots, which, if cut clean over when size for wands, are a profitable crop, and are thus removed before they can to any extent become injurious to the timber trees.

Unless where the trees are *specially thinned out* for the growth of underwood, the coppice shoots are to a great extent under the control of the timber crop; hence there is practically no necessity for going to *expense* of grubbing. No really practical man expects to have a profitable crop of underwood with a full crop of timber trees. But there are always exceptional cases where it is well to encourage its growth, such as open spaces that accidentally occur in hardwood plantations; and also not unfrequently in ornamental belts and clumps that are composed chiefly of old trees, standing at a considerable distance apart.

Natural coppice, when grown as underwood, should be thinned out after two years' growth, leaving about six shoots on each stool, and except in plantations where the trees are standing very wide apart, these shoots should be clean cut over after from six to eight years' growth. If a regular method of this kind is carried out the timber crop will not be greatly injured, and in districts where there is a good sale for coppice produce it will much more than pay the expense of growing it.

ON THE CORSICAN FIR.

By John Nisbet, Assistant Conservator of Forests, British Burma.

[*Premium—The Medium Gold Medal.*]

Until the year 1583 the Corsican fir was regarded as identical with the Scotch fir (*Pinus sylvestris*), when Clusius (*Flora Niederoesterreichs*) called attention to the differences existing between the trees. Poiret, in 1804, again dealt with this subject, and gave to the former the name *Pinus laricio;* by Host it was in 1826 called *Pinus nigricans;* by Höss in 1830 *Pinus austriaca.* Christ ("Europ. Abietin," page 15) subdivides the species *Pinus laricio* (Poiret) as follows:—

a. Tenuifolia. Leaves scarcely 1 mm. thick, 9–15 centimeter long.

α. *Pyrenaica* (Gren. Godr.), with cones 2–2½ inches long, a tree attaining a height of 140 feet.

β. *Cebennensis* (Gren. Godr.), cones smaller, height of tree 20–33 feet.

b. Crassifolia. Leaves 1.5–2 mm. thick, very stiff, 10–16 centimeter long.

γ. *Poiretiana* (Endl.) Bark of youngest shoots light brown, cones egg-shaped, thin, often slightly bent, 5–7 centimeter long, greenish yellow to rich brown, the apophyses with a blunt horizontal swelling. Tree of 100–130 feet in height, and 17 feet in girth, often attaining the age of over 500 years.—Spain, Corsica, Italy, Sicily, Greece, Candia.

δ *Au striaca* (Endl.) Bark of youngest shoots greyish brown, on older parts dark grey. Cones as on *Poiretiana,* but mostly greenish yellow, the apophyses with sharp horizontal swelling. Height of tree 70–125 feet, girth 10–13 feet. It occurs also as a shrub over very dry lime.—Lower Austria, Steiermark, Hungary, Galicia, Siebenbürgen, Banat, Croatia, Dalmatia.

ε. *Pallasiana* (Endl.) Leaves of a lustrous dark green. Cones 4 inches long, egg-shaped. Apophyses light brown. Height often inconsiderable (and then it bears small cones), sometimes reaching 100 feet.—Crimea, Asia Minor.

Concerning the above synopsis of the varieties of *Pinus laricio,* Willkomm* remarks: "All these forms intermingle, most frequently in the case of γ and δ" (*Poiretiana* and *Austriaca*), "which, at best, can scarcely be distinguished."

For the forester, therefore, it is sufficient to consider the tree in question as the black, Austrian, or Corsican pine (or more laxly, Fir), *Pinus nigricans* (Host),—*P. Austriaca* (Höss),—*P. laricio* (Poiret), and throughout this report these terms are regarded as synonymous.†

As regards its geographical distribution, the Corsican fir occurs more or less regularly along the northern shores and on many of the islands of the Mediterranean sea. Starting from Corsica as a central point, it is found, towards the west, forming large natural forests on the mountains of central and south-eastern Spain and on the Appennines; towards the east, in lower Austria,

* Willkomm, "Forstliche Flora von Deutschland und Oesterreich," 1872, page 188.

† Carl Heyer, "Waldbau," second edition, Leipzig, 1864, page 17, also regards these terms as synonymous.

Krain, Istria, Carinthia, Servia, and Banat. In Croatia and Moravia it is seldom reared in pure forests.

Throughout parts of Germany, France, Norway, and Scotland its cultivation has been attended with success, although as pure forest it seldom covers large areas.

The height to which it ascends above the sea-level is not exactly known: some authors quote 2000–3000 feet, others 3000–4000, while a third class claims to have found it at a height of 4000–6000 feet above the sea. Towards the southern and south-eastern limits of growth, it naturally ascends furthest up the mountain slopes.

On the average the Corsican fir begins to bear good seed about the 30–35th year. The flowers are developed a little later in the spring than those of the Scotch fir. The female flowers, of a bright red colour, after being fructified by the yellow pollen of the male catkins, form small dark reddish cones during the first summer, which, increasing to the size of 3–4 inches, and with a covering of a glistening wax-like substance, attain maturity at the end of the second summer. The seed remains in the cones until the warm breezes of the following spring cause the bracts to open, and scatter it around the parent tree. It may be borne by the wind to a distance of two or three times the height of the tree. In order, then, to procure seed, the cones must be plucked in autumn or winter. The seed is larger than that of the Scotch fir, of a dull white colour, much resembling that of larch-seed. It germinates in two or three weeks after having been sown (80 to 90 per cent. of the quantity on the average germinating), and during the first year has only single leaves, which in the second year wither and form sheathes for the double leaves that then make their appearance; from the third year onwards whorls are formed.

Its finely serrated leaves, enclosed in twos, rarely in threes, by the sheaths, of a rich dark green, are longer than those of the Scotch fir, and remain usually four, under favourable circumstances, five or six years attached to the twigs; the leaves of the latter are cast off after two or three years, which partly proves that the Corsican fir can bear more shade than our Scotch pine.

Its growth during the first few years is rapid, but not continuous; it at once forms a tap or perpendicular root, by means of which it is enabled to offer considerable resistance to storms, that cause such destruction in forests of spruce or of silver fir in exposed situations. On the average, its growth in height is completed about the eightieth to the hundredth year.

Reared in pure forests, by means of the leaves cast off in early years, together with the unbroken roof of foliage protecting the moisture of the soil, and not admitting sufficient light to favour the growth of weeds, it has the power not only of preserving the

strength of the soil over which it grows, but also of increasing it in large measure; this property it possesses in common with the spruce and silver firs, the Scotch and the Weymouth pine (*P. strobus*). Later on, about the twentieth to thirtieth year, unless recourse has already been had to the axe, it naturally thins itself out. The struggle between the stems for the mastery is not of very long duration, though not as short as in the case of the Scotch fir; it can bear more shade than the latter, and when the stems are partly overshadowed by their stronger neighbours, they are more tenacious of life and hold out longer. Such a struggle for life may best be noticed in forests of spruce or of silver fir, and, in consequence, in such woods there is a greater number of stems per unit of area, while at the same time difference in diameter between the strongest and weakest classes is more striking than in the pine forests. While the natural process of thinning out is going on, a covering of mosses (mainly varieties of *Hypnum*) becomes formed under the favourable influence of the subdued light cast on the ground. This moss supplies the place of the former most abundant fall of leaves; it protects the soil from the heat of the sun and from the winds; it absorbs and retains moisture; when the lower parts of the stalks decompose, they give to the soil all the constituents of the leaves, though not in the same proportion.* But if the *Turnus* be fixed for too high an age, the number of trees per acre decreases, the amount of sunshine now falling on the soil is not favourable to the development of the moss, it withers and disappears, its place being usually taken by varieties of grasses and other plants which exhaust the supply of humus without materially improving the soil. The vegetable mould yielded by some plants is in fact detrimental to the growth of the next generation of the forest trees. For example the humus arising from *Cenomyce (Cladonia) rangiferina* and several other *Lichenes* is like dust; *Calluna, Erica and Vaccinium,* on decomposing, form a vegetable mould rendered unsuitable on account of its containing tannin and wax. Such kind of humus ought to be removed before sowing or planting operations have commenced. They announce to the forester that the soil is, at least at the surface, impoverished. It is only on good soils (where it may be observed the pines do not thin themselves so rapidly, and the covering of moss remains longer), that shade-loving, or at least shade-bearing, trees or shrubs with light seed find their way into the forest, and aid in retaining and improving the quality of the soil.

Like other conifers, with the exception of the Yew (*Taxus baccata*) and the larch (*Larix Europæa*), the timber of the Corsican fir has no vessels but simply canals, like pores, which contain a

* Proved in 1851 by Vonhausen of Giessen, who analysed *Hypnum splendens, H. purum,* and *H. tennariscinum*.

resinous fluid. As they always occur singly and in small numbers, they do not sensibly affect the technical qualities of the timber, although the substance contained in them is of no mean importance. These canals are to be found only in the bark and in the so-called autumnal zone of the autumnal rings. As they are connected with the medullary rays, the essential oil or fluid is enabled to circulate throughout the whole tree; on coming in contact with the atmosphere it becomes more or less hard and brittle by a process of oxidation. As the Corsican fir gets older, this fluid stores itself up in the inner wood, now inactive, and forms an apparent heart, easily distinguishable, however, from the true heartwood.

The presence of resin makes the wood hard, limits the bounds of elasticity, but renders it more tough or flexible; it therefore makes the wood more difficult to split; but when a large supply of resin is present it then becomes brittle. Resinous timber offers most resistance to the inroads of disease, since the woody fibres are thus guarded against the influence of moisture and of atmospheric oxygen, and is least exposed to the attacks of insects that only find a too favourable breeding-place in timber already in an unhealthy condition.

A thin section of the wood will be found to have a silky gloss on account of the medullary rays being very minute and close together.

In referring to the specific weight and technical qualities of the wood of the Corsican or Austrian fir, it must be observed that the values assigned can by no means remain constant; they vary not only according to the strength of the soil over which the tree has grown, and with the amount of moisture contained in the same, but also according to the exposure of the hill-sides towards one or other of the points of the compass. A soil too rich or too moist produces light and porous wood with little resin; northern slopes yield a larger quantity of timber but of an inferior quality to that which is grown on hill sides with a sunny southern aspect.

A difference between the wood of conifers and that of other forest trees is here worthy of note, since it, of course, immediately affects the timber of the Corsican fir. The wood of the conifers is, *as a rule*, heavier and more durable the smaller the annual rings are, while the reverse holds good of that of other forest trees. Experiments have shewn that, no mattter how broad the annual rings may be, the compact so-called "autumnal zone" acquires in conifers, *as a rule*, dimensions not determined by the breadth of the "spring zone;" in other words, when the annual rings are broad the diameter of the compact zone is small, when they are small it is large, in comparison to the diameter of the whole year's ring. On the other hand, in such forest trees as

oak, ash, elm, maple, beech, and hornbeam, the "spring zone" remains more or less constant, while the "autumnal zone" (consequently also the weight and durability of the timber) depends on the total breadth of the annual ring. The following table (extracted from Nördlinger) tends to give a general idea of the specific weight of the Austrian or Corsican fir as compared with a few of the most common conifers, although, as before stated, the values are not to be regarded as constant:—

	LIMITS.		MEAN SPECIFIC WEIGHT.	
	Green. (Containing approximately 45 per cent. water.)	Dry. (Containing approximately 15 per cent. water.)	Green.	Dry.
Pinus Laricio (Poiret) .	0·90–1·11	0·38–0·76	1·00	0·57
Larix europæa (D.C.) .	0·52–1·00	0·44–0·80	0·76	0·62
Pinus sylvestris (L.) .	0·38–1·03	0·31–0·74	0·70	0·52
Abies pectinata (D.C.) .	0·77–1·23	0·37–0·60	1·00	0·48
Picea excelsa (D.C.) . .	0·40–1·07	0·35–0·60	0·73	0·47
Pinus Strobus (L.) . .	0·45–1·02	0·31–0·56	0·73	0·43

This would prove it to be one of the heaviest of the conifers generally cultivated in the temperate zone.

Its wood is neither hard nor elastic, and is difficult to split by means of wedges. On being cut up into planks, &c., it shrinks and swells but moderately. As regards durability, it ranks between the larch and the Scotch fir, and, when with narrow annual rings, and containing a large quantity of resinous fluid, is well suited for exposure under unfavourable circumstances, *e.g.*, railway sleepers, wooden pipes for drainage purposes, &c. When the above conditions are fulfilled the Corsican fir, together with the larch and the Scotch fir, yields in durability only to the oak, and must be looked upon as supplying one of the hardiest timbers capable of being reared in our climate. As fuel it also possesses high value, but, coal and peat being plentiful, it will never be cultivated in Scotland solely on that account.

Notwithstanding the good qualities possessed by the timber, this tree is frequently used for the purpose of gaining oil of turpentine, colophonium, tar, lamp-black, charcoal, and the like.

In the wild, thinly populated, mountainous regions, where the Corsican fir is mostly to be found forming pure forests, there is but little demand for railway sleepers, beams for mill-wheels, timbers for pit shafts, &c., and as the expense of conveying the forest produce annually to a favourable mart would scarcely be covered by the prices realised, the proprietors must seek to derive an income from the tree in another manner; they extract

the fluid circulating throughout the canals, sparing, however, if prudent, such stems as promise to yield large and valuable timber.

Among the European conifers of the present time the Corsican fir yields the largest amount of resinous fluid. The quantity contained in a tree depends on the state of health it is in, on the strength and warmth of the soil over which it grows, on the amount of light it enjoys (*i.e.*, the development of the crown), and on the warmth of the climate; in southern lands more resin per stem is won than in northern, more also when the crown of the tree is fully exposed to the enlivening influence of the sunlight.

The following sketch is intended to show how this valuable product may best be obtained:—

About ten years before a wood is to be felled wounds are made in spring (fig. 1) close to the foot of the trees, and as the resinous fluid is chiefly in the sapwood, these must be made partly into the latter. The wound is deep and shaped like a swallow's nest; in it the fluid collects, and is thus prevented from trickling down to the ground. At the same time the bark of one-third of the circumference of the tree is peeled off to a height of 16 to 18 inches, the workman here also cutting some distance into the sapwood with a knife or hatchet. To convey the viscous mass into the swallow's-nest-like receptacle, a groove is made on each side of the wound sloping downwards towards the middle.

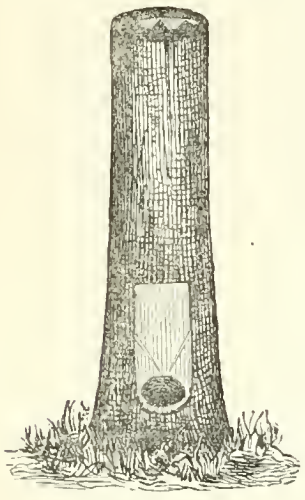


Fig. 1.

From the end of April onwards the resinous substance is collected every two to three weeks, and each time fresh pieces of the bark and sapwood in a sideward direction are removed, until only one-third of the circumference has a covering of bark at the end of the first summer. In autumn the resin, that has oozed out after the regular time of collecting it, becomes more or less oxidised, and consequently of less value; it is scraped off with iron instruments in November. In the following years the wound is annually increased 16 to 18 inches in height, and grooves are made as previously. At the end of ten years (fig. 2) the bark around two-thirds of the stem has then been removed to the height of 13½ to 15 feet; the remaining strip of bark is sufficient to keep the tree alive.

A tree from 90 to 120 years of age can yield *per annum* 5½ to 10 lbs., *i.e.*, during the ten years 55 to 100 lbs., of raw resin. The amount of more valuable viscous resin obtained during the

summer months, compared with the more or less oxidised mass gathered in November, is as 3 to 2. In Austria the income derived from this source varies from 2½d. to 6½d. per stem per annum, according to soil, exposure, climate, appearance of tree, enjoyment of light, &c. The larch is also forced (by a process of boring) to yield turpentine (the Venetian turp of trade), but the receipt is approximately only 1d. per stem per annum, and the quality of the timber is materially affected thereby.

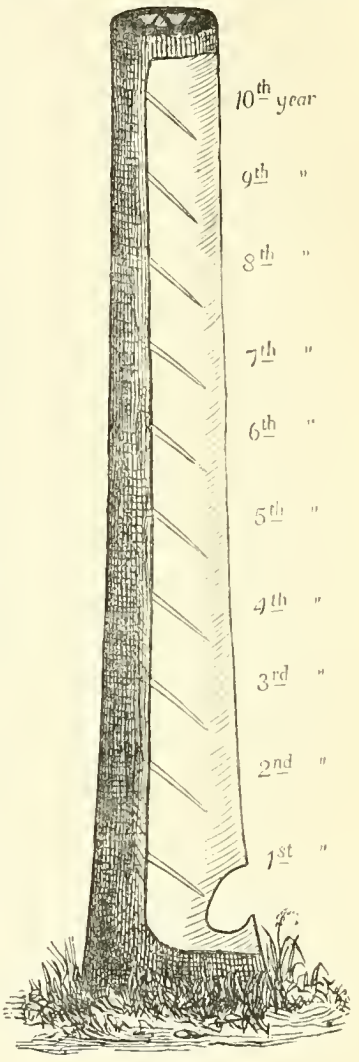


Fig. 2.

The products of the tree thus obtained may be enumerated as follows:—Colophonium, oil of turpentine, turpentine, white pitch, and cobbler's wax. Tar and creasote are gained at the charcoal kiln, 100 cubic feet of wood yielding about a firkin of tar; lamp-black is manufactured by a separate process. This resin contains more oil of turpentine than even that of *Pinus maritima*, for whose cultivation so much has been done in France; in rough numbers 20 lbs. of oil of turpentine and 70 lbs. of colophonium are extracted from 100 cwt. of the raw material.

During the American war the demand for such articles was so great that prices doubled themselves; since then they have fallen, but the supply annually brought into the market is still very large.

In his visits to the forests it is not improbable that the forester may find that younger trees, or such as were not by the proprietor intended to yield supplies of resin, have maliciously been wounded as above described. Even though he suspect the party or parties thus fraudulently endeavouring to realise an income, however small, from forests not their own, yet only by chance will he be enabled to detect the offenders in the act of appropriating the resin; but by a cheap and simple means he will soon succeed in putting an end to such practices. Having discovered trees, or areas, thus improperly made use of, let him at home dissolve some quicklime in water, and, repairing to the forest, coat over the wounds with this solution by means of a common paint-brush. On being gathered such resin in no way appears different from that which has not in this manner been tampered with, but once in the hands of the merchant, and

subjected to the influence of heat, it becomes soapy and useless for the purpose of producing turpentine and colophony. The reason is as follows:—Resinous oil is a compound of glycerine, therefore when boiled with a caustic alkali undergoes saponification, *i.e.*, the caustic alkali decomposes the compound, forming an alkaline stearite (soap), and liberating the glycerine, which passes into solution. Resins acted on as above will *only once* be resetted, and the evil practice will thus speedily be put an end to, seeing that the class of people committing such thefts do not do so for amusement, but in order to gain the necessaries of life; consequently, if resetters refuse their wares, they must be compelled to turn their attention to some other mode of employing their time.

The advantage to be gained by extracting the resinous fluid is the deriving of an income from forests lying in remote parts, where the timber is of little value. Nature, however, has made no provision for it being cast forth, on the contrary, she stores it up in the inner wood, so that its extraction must act detrimentally on the vigour and development of the tree. The annual increase of growth cannot be so large as if the tree had still the full covering of bark, and were in a normal condition. This diminution (about one-third) of the annual increase of growth, however, is more than amply repaid by the income derived from the resin. The stems are more liable to be broken by snow and storms, and a large quantity of what would be serviceable timber is damaged, unless the operation has been prudently conducted. The quality of the seed becomes inferior, and if exported may, by yielding weakly plants, discourage the rearing of this tree under circumstances which might render its cultivation remunerative, and would improve the water supply of a district (*e.g.*, the planting up of barren, limy hill-sides of considerable extent). In the case of the Corsican fir, the supply of resinous fluid seems, curiously enough, to increase instead of diminishing under this treatment, and such wood saturated with resin is then more highly prized, both as fuel and as charcoal (the tar won at the kiln being equal in importance to the charcoal itself). The roots are often dug out, and used for manufacturing tar, lampblack, and charcoal, being sold at prices that yield a fair profit after covering all expenses.

A not inconsiderable income may be derived from gathering the cones in good seed-years, and extracting, either artificially or simply by means of the sun's heat, the seed. During the last ten years the average price has been about L.10, 10s. per cwt., or 1s. 10½d. per lb., having doubled itself since much has been done for its introduction as a forest tree into France, Germany, Holland, Norway, and Scotland.

The leaves, like those of the Scotch fir, are, after a process of

maceration and bleaching, manufactured * into "*Pine wool*," a substance used for stuffing mattresses, pillows, &c. A hot bath of the fir leaves is supposed to possess a healing power, and there are many fashionable little bathing-places which have, partly on that account, acquired a reputation.† A spirituous beverage, dignified with the name of "toddy," is also decocted from the leaves of this and other pines, and at present advertisements regarding this toddy may frequently be noticed in the German newspapers.

This tree must be characterised as one that does not make high demands on the quality or richness of the soil, but it can as emphatically be asserted that it prefers such as are of a limy nature. Although the Corsican fir, if cultivated over sand or loam, usually thrives moderately well, still these soils cannot be regarded as its home. It is mainly over lime, more especially over the magnesian variety (Dolomite), that natural forests of the tree are to be looked for. On shallow, stony, and dry lime, with but a poor admixture of vegetable mould, it will be found to prosper better than any other tree; it speedily sends its roots deep into the clefts of the rocks and manages to gain sufficient nourishment, although, of course, under such unfavourable circumstances it cannot attain the same length of bole as over a deeper soil. A dry soil is more suitable for its growth than a moist one, and therefore such subsoils as rapidly permit a superfluity of moisture to effect an escape are more favourable than such as retain the same; cleft and tilted strata are thus preferable to uncleft massive rocks, horizontal layers, plastic clay, or moorpan.

As regards exposure, it loves the warm sunny south-eastern, southern, and south-western slopes, which are less moist than those inclined towards the north. By virtue of its strong root system it can withstand the storm better than any other conifer.

In the "Wienerwald" near Vienna two kinds of soil are to be found, viz., a sand yielding a deep loam containing lime, and low lime hills. It is on these latter that the largest pure forests in Europe of Corsican fir, Austrian or black pine, is to be met with; it alone covers about 26,000 acres or 40 square miles, while in addition the fir also occurs here and there among the other forest trees. It has been brought down from the mountain slopes to cover the dry boulder area, the "Stemfeld" near Neustadt, 1300 acres or two square miles in extent, and there it gives better results than any other tree, by means of the rich fall of leaves most speedily accomplishing the enrichment of the unfruitful soil.

Around Trieste large plantations are being made in a hilly district named the "Karst," over an impoverished chalky soil

* For instance, at the Brill, near Vienna.

† As one of such may be mentioned Arkachon in the Landes.

mingled with stones and rocks, which, after having been formerly cleared of old timber, was used for grazing, much to the detriment of the young plants, that, browsed on by the cattle, became deformed, and did not fully protect the ground against the combined action of the sun's rays and the winds. A limy soil, when directly acted on by the light and heat of the sun and exposed to the winds, soon becomes overrun with weeds and grasses (*e.g.*, *Kœleria cristata*, *Brachypodium pinnatum*, *Melica ciliata*, *Stipa pennata*, *Festuca glauca*, *Carex glauca*, and when more or less dried up, *Sesleria cærulea* and *Festuca ovina*). If measures be not at once taken to restore a protection for the moisture in the soil, the growth of the trees becomes languid, the hues of the orchids and others of the lime flora disappear from the eye, and gradually grasses, such as the above-mentioned, gain the upper hand, and in turn become sickly and deformed; the surface soil is impoverished, leaving an unwelcome field open not only for the ingenuity, but also for the patience and perseverance of the forester to whom the laborious task of planting up such wastes is assigned. The reclaiming of such land is one of the most difficult and trying tasks the forester can undertake. Sowing operations will in most cases be found not very successful, and recourse will usually be had to planting. In dry years a high percentage of the young plants will die off; as the snow melts in spring, and in wet years, they will often be washed down the hill sides, and the necessary repairs in the plantations may require to be made several times, and thereby become very expensive for the proprietor. Such *reboisements*—we speak of lime—are generally carried out by the aid of the Corsican fir. As examples may be quoted, the planting up of the Weperberg at Fredelsloh (in the Hanoverian Oberförsterei Rothenkirchen), a very exposed hill of Muschelkalk between the Leine valley and the Solling hills, and of the Muschelkalk hills opposite the village of Fischbach, near Eisenach. When the soil has lost almost all its vegetable covering, then seed of some of the lime-loving grasses already named ought to be sown before the planting up is carried out; in wet years they prevent the surface soil from being washed away easily, and when drought prevails they always afford some little protection for the small quantity of moisture contained therein.

In parts of the "Riesengebirge" of Silesia, as also in the communal forests of Arnsberg in Westphalia, experiments have been made to acclimatise the Corsican fir, and these promise well, although the plantations are not very old. At the latter place the cultivation of the Weymouth pine (*Pinus Strobus*) had previously been tried, but was found not to answer so well.

The forest district "Steinberg" (in the Hanoverian Oberförsterei Dickholzen, near Hildesheim) is a hill belonging to the Keuper formation. In the valley below there is a marshy soil, on

the heights above, sand with a good percentage of lime. After the State had bought up the grazing privileges exercised by the neighbouring villagers, the slopes were planted up about twelve years ago. In all sheltered localities hardwoods were planted, but on the exposed places a mixture of conifers. For four reasons the Corsican fir was there given the preference as regards numbers.

1. For soils containing a good percentage of lime it is better suited than any of the others, which here sooner fall a prey to the red-rot (Ger., "Rothfäule"), due, according to Willkomm, to the fungus *Xenodochus ligniperda*, Willk.)

2. It resists the fury of the storms better than any other conifer.

3. It improves the soil so rapidly.

4. It scarcely suffers from frost at all.

The course adopted has up till now given satisfaction.

Along the roadsides near Munden one often meets with this tree in groups of three or four over the Buntersand, but in general they do not have a thriving and healthy appearance, owing, no doubt, partly to the woods (usually only about 100 to 150 yards in breadth, and lying on the hill slopes between the railway and the public road) not being properly taken care of, and partly to the absence of a large percentage of lime in the soil.

At forest district "Stapelberg" (in the Hanoverian Oberförsterei Adelebsen, near Goettingen), the Corsican fir may be seen playing the *rôle* merely of a soil-improver. The Stapelberg is a single ridge of Muschelkalk, about a quarter of a mile long and 160 feet high, surrounded by arable land. The soil is sufficiently good for the rearing of high timber; but, owing to the hill having such an exposed position, the wood is managed as coppice, which consists of beech, oak, hornbeam, maple, and hazel; while here and there shrubs of *Cornus*, *Euonymus*, &c., bear testimony of the soil's mineral strength. Only on single rocky parts, where the rains had almost washed away the surface soil, Corsican firs had been planted, and now amply fulfil what was expected of them. They, of course, cannot spring from the stool (among the conifers only the yew and, in youth, the larch, on account of their spiral vessels, can do so), they should be left standing for the present, and at the end of each *turnus* in after years a timber stem here and there, and those dead or unhealthy should alone be felled (Ger. "*Fehmel*" or "*Plänterbetrieb*;" Fr. "*Jardinage*"). Such spots are always difficult to plant up if laid bare.

In places where late frosts annually do damage to young plants of oak, beech, &c., the Corsican fir is often sown as a protection; it grows very rapidly during the first three or four years, overtopping the oaks, &c., and thus affording them a

shelter. When the other plants are not so much exposed to the danger, *i.e.*, when they have grown out of the influence of the cold strata of air, the fir may then be at once removed.

The reproduction of forests of this tree may take place either by natural or by artificial means. The natural reproduction may be effected in three ways, viz.:—

1. Long thin strips of forest land are cleared of their timber, and the area laid bare is allowed to remain uncovered until the wind wafts the seed from the neighbouring trees to the open space. The shape of these areas ought then to be a long narrow rectangle, whose longer side is at right angles to the direction of the winds prevalent at the time when the cones open and the seeds fly out; the direction in which the forest is reproduced should consequently be contrary to that wind, except in extremely exposed situations, in which even the Corsican fir is apt to be broken or uprooted. Then the fellings must go contrary, and with the longer side perpendicular to the most dangerous wind. The breadth of such rectangular fellings should not at most exceed about 200 feet; the broader they are the longer the area is of being covered with young plants. The reproduction is uncertain, and usually of long duration; in the meantime, the increase of growth that would have been obtained had sowing or planting operations been begun immediately after the clearing is in great part lost, the soil is exposed to the danger of becoming impoverished, and the young woods, besides being as a rule incomplete, are composed of plants of different ages, scattered either singly or in groups over the area.

This method will only be practised in out-of-the-way places, where, in order to cover the expenses of the necessary slips, &c., for conveying the timber to a favourable mart, all that is on the area must be felled at once, while at the same time it does not pay to sow over or plant up the clearance. It is almost superfluous to remark that the fellings must not be carried on annually at the same part of the forest, for in that case the total clearings would grow very broad, and seed would not reach the older ones.

In parts of the Austrian Alps this mode of natural reproduction is pursued, but for Scotland it can be of little importance.

(2.) By means of trees left on the area after felling operations, for the purpose of casting seed around them.

As the woods of Corsican fir, about the age of 70 to 100 years, are light, and not with a closed roof of foliage, like the beech or silver fir for example, the preparatory felling generally necessary in the case of these latter is not requisite, the seed felling, for which only about 23 to 30 trees left standing per acre suffice, can at once be made. Seed is produced almost annually, although not frequently in large quantities, so that it generally lasts about four or five years before all the seed trees are cleared

away. When the young plants make their appearance, the stems around must be felled as soon as possible, for they cannot bear the shade of the parent trees.

Natural reproduction not being generally practised in Scotland, this method will probably find little application; but for very shallow and stony surface-soil, that might easily be washed away, or speedily made utterly barren if altogether denuded, it cannot be too strongly recommended.

(3.) By the method known in Germany as "*Fehmel*," "*Plänter*," or "*Schleichbetrieb*," and in France as "*Jardinage*."

Here and there, throughout the whole, trees are cut down singly or in groups, and nature is generally left to repair the damage as best she can. This should only in Scotland be applied on very exposed situations.

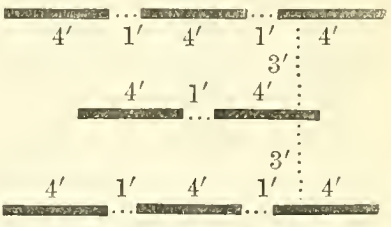
The artificial reproduction, or the cultivation of the fir for the first time, may take place either by sowing or by planting.

(1.) Sowing.

On the poorer or exposed loamy (limy), sandy, and limy soils, where the Corsican fir will generally be reared, sowing will frequently be found not to answer as well as planting, for it is just during the first year or two that the young plants are exposed to most dangers.

If, on hill-sides, about 7 or 8 lbs. of seed is often sown in horizontal rills of 3 to 4 inches breadth and depth, which do not, however, form continuous lines along the hill (fig. 3); the distance between the parallel rills is usually 3 to 4 feet, their length in a horizontal direction about 4 feet, with 1 foot of space between each two. When there is danger of grass, &c., overshadowing and choking the young plants, broader bands are cleared, the breadth varying according to the magnitude of the danger. The seed needs but little covering with earth.

Fig 3.



Another method, applied when the soil is still well provided with turf, is to sow about 12 lbs. of seed per acre broadcast, and go over it with the harrow.

It is more than probable that the seed may at places be washed away, or the young plants here and there die, but if such damage be not of too great extent the recruiting may be done by means of seedlings taken from the parts where most plants stand. This will be less expensive than bringing the material from a distance.

(2.) Planting.

Planting will in general be found to succeed better than sowing, and, on the whole, not much more expensive if cheap methods of planting be adopted. The operations ought to be

carried out in spring rather than in autumn. The distance between the plants is usually 3, at most 3½ feet, otherwise the Corsican fir soon assumes a crooked growth.

On limy loams and sands furrows may be ploughed, and one or two-year old seedlings planted out in the usual method; over lime it is best not to loosen the soil more than is requisite.

When plantations are made with material that is three, four, or more years old, pit planting, or planting with balls of earth around the roots, although more expensive, is then necessary.

For the planting up of impoverished soils younger plants with balls of earth around the roots may, with good results, very easily and cheaply be transplanted from the nursery by means of Heyer's cylindrical spade. This little instrument, if not already in use in Scotland, is worthy of introduction.* The cylindrical spade (fig. 4), (Ger. "*Hohlbohrer*"), is from 30 to 38 inches in height; the handle of wood is fastened by iron bands to the wooden stalk, the lower part is of iron. The lower diameter of the cylindrical sheath varies from 1½ to 5 inches, but 3 may be taken as the average; the upper diameter is a few lines more, and the height is usually equal to the diameter. The stem of the young plant being allowed to pass through the opening *c a*, so as to come into the middle of the circle, the instrument is forced into the soil up to *d*, where a small iron plate prevents its further progress. One side *c c* is sharpened, the other remaining blunt, so that there is little danger of the workman cutting his fingers in getting out the ball of earth. The whole is turned by means of the handle, and then drawn out, plant and earth remaining in the cylinder owing to friction. By placing the hand across *b d*, inverting the instrument, and, if requisite, applying a slight pressure from above with the thumb, the cylinder of earth falls gently into the hand. The holes into which the plants are to be brought are prepared with similar instruments of the same dimensions, and are thus rather larger than the balls of earth; but both having been slightly compressed during the operation, the first shower of rain (after planting out) corrects this. On inserting the balls the workman (or boy) presses them down firmly with his thumbs, so as to facilitate their adhesion to the surrounding soil. A lad or a woman can, with a circular spade

Fig. 4.

* Extraneous matter, such as the above, may be found intruding itself throughout the report. The only apology that can be offered by reporter is the desire to introduce into Scotland instruments, practices, &c., which have in Germany proved worthy of notice.

of 2 inches diameter, plant 700 or 800 seedlings per diem, including carrying them a short distance from the nursery. For dry, loose sand, or for very wet soils, this instrument is not intended; such soils are not cohesive enough to form the balls of earth.

A word or two concerning mixed plantations can here not be out of place. The mixture of this along with the Scotch fir cannot be recommended, for the latter grows more rapidly, and soon overshadows the former, which, although bearing more shade than either the Scotch or Weymouth pines, gradually gets unhealthy and deformed. As an associate for the spruce or silver firs it is not well suited; even if gaining a slight advantage during the first few years it soon is overtaken, and then all hope of its recovery is lost. If single stems, equally distributed over the area were allowed a few years' growth in advance (*e.g.*, planting four-year old Corsican firs and sowing silver or spruce firs), the growth soon becomes crooked and the branches spread out widely; later on, if the other firs are of more rapid growth, their top shoots, and buds are damaged or cut off by the far-spreading elastic branches.

Concerning most mixtures of this tree, sufficient observations have not yet been made; the appearance it would present if occurring singly among beech, oak, larch, Weymouth pine, &c., can only be conjectured by the aid of theory, practical and reliable data being on this point awanting. On the whole, it seems not well adapted for forming mixed forests, as the amount of timber it yields is not great, but under certain unfavourable circumstances (as already described on pages 230 and 231), it may frequently be called into requisition.

It has previously been remarked that the Corsican fir offers more resistance to storms than any other conifer usually cultivated in our climate, and that it scarcely suffers from frost. Occasionally, however, the frosts of spring give rise to a peculiar disease, called by German foresters "Schuette," that causes young plants to wither. The leaves first assume a yellow unhealthy hue, and finally, when life in the plant has ceased, change to a rusty red colour. The Corsican fir is less exposed to the danger than the Scotch fir. It frequently attacks young plantations in situations fully exposed to the sunlight, and is supposed* to be due to the considerable difference of temperature between atmosphere and soil that is often observable in spring. The sun raises the temperature of the air to such a height that a large amount of moisture is exhaled from the leaves, while, on account of the soil, temperature still being comparatively low, the root system is not enabled to yield fresh stores of nourishment to supply the

* Prof. Ebormayer "Die physikalischen Einwiskungen des Waldes auf Luft und Boden." Aschaffenburg, 1873.

deficiency and thus maintain a proper balance. The only mode of prevention must be to endeavour to give the young plants some shelter (*e.g.*, reserving a few of the parent trees per acre), if natural reproduction be employed, or planting three to four year old larches or birches (better, however, larch) here and there to shed a beneficial, by no means deep, shadow around, if sowing or planting operations be carried out.

Snow and hoarfrost likewise do not cause so much breakage as in the case of the Scotch fir, for though the leaves being longer afford a better resting-place for the snowflakes and dew, yet the twigs and branches are more elastic.

For a long time it was considered that the cockchafer (*Melalontha vulgaris*) was the only insect that did much damage to this tree (by gnawing the bark from the roots of young plants when a grub), but more recent and accurate observation has proved this opinion to be incorrect. The localities in which insects will most frequently be found making attacks must be such as are unfavourable to the growth of the tree, or where it is cultivated along with, or in proximity to, species of conifers, most commonly destroyed by insects, *e.g.*, Scotch and spruce firs. A large supply of resin must act as a safeguard, so that forests on rich, deep, and fresh soil, or on the cool, moist northern, north-eastern, and north-western slopes will be more exposed, seeing that under such circumstances less resinous fluid is produced.

The names of the insects already observed on the Corsican fir may here be briefly enumerated, without, however, going into details as regards nature and amount of damage usually done, &c.

On the root, stem, or branches—*Hylobius pini*, *Pissodes notatus*, *Melalontha vulgaris*, *Bostrichus hidens*, *B. laricis*, *Hylesinus piniperda*.

On buds and young shoots—*Hylesinus piniperda*, *Tortrix Buoliana*, *T. resinana*, *T. turionana*.

On leaves—*Liparis monacha*, *Lophyrus pini*. *Liparis dispar*, *Gastropacha pini*, *Noctua piniperda*, and *Geometra piniaria* will also, in all probability, soon be added to this list.

Great damage is seldom done to old trees; occurring in general before the 20th year, and not unfrequently causing serious apprehension for the future of the young forest.

It may not be without interest to state the quantity of timber per acre yielded by the Corsican fir, and the average periodical increase of growth.

Amount of wood per acre,

Age of Forest.	Cubic feet per acre on limy loam.		Cubic feet per acre on stony lime.	
	In toto.	Average annual increase of growth.	In toto.	Average annual increase of growth.
10	177	17·7	82	8·2
20	640	32·0	477	23·8
30	1153	38·4	757	25·2
40	1692	42·3	1044	26·1
50	2327	46·5	1331	26·6
60	2928	48·8	1638	27·3
70	3344	47·7	1959	28·0
80	3645	45·6	2238	28·0
90	3849	42·8	2491	27·7
100	4000	40·0	2730	27·3
110	4143	37·7	2935	26·7
120	4286	35·7	3071	25·6

It cannot escape notice that the average increase of growth reaches its culminating point on the better soil at the 60th year, on the poorer at the 70th, and then continues in the latter case for the space of ten years at this point before the average begins to decrease. The accuracy of the data is therefore open to serious doubts, for it is a fact well known to the forester, that on poor soils the culminating point of the average increase of growth is arrived at sooner than on richer ones. Over the stony dolomitic lime this average for the first ten years is 8·2 cubic feet per acre. while during the following decennium it shoots up to 23·9 cubic feet, thus almost trebling itself in that short time. This may probably be due to the great dryness of stony lime, which compels the young trees to develop a very large root system at the expense of the ascending axis during the first few years.

In comparing the above results with those yielded by the Scotch fir (which, *en passant*, in Hanover reaches its culminating point* on poor soil in the 40th year, on very good soil, however, not until the 70th), it must not be forgotten that these data apply to Austria, to the home of the tree, and would for Scotland in all likelihood prove too high.

Throughout the preceding the economy of the Corsican fir, black or Austrian pine, as a forest tree in the countries to which it is indigenous has been described at length ; a few remarks concerning the advisability of cultivating it extensively in Scotland alone require to be made in conclusion.

We have noticed that the quality of its timber is in great measure dependent on the quantity of resinous fluid contained therein, and that the latter again varies directly with the

* See Bürckhardt's "Hülfstafeln für Forsttaxatoren." Hanover, 1861. Page 25.

warmth of climate, the warmth and aspect of the soil, and indirectly as the depth and moisture of the soil and subsoil. In our humid island climate it is indeed questionable if the probable income derivable would justify our advocating its introduction on an extensive scale. As a means of planting up and improving waste lands, more especially if of a limy nature, its services may frequently be called into requisition, but merely as a stepping-stone to pave the way for the cultivation of some other more profitable tree. The results already attained in Austria, and, although on a smaller scale, in Germany, prove its high value in this respect. But in localities where the same end can be gained by means of the Scotch, or the spruce fir, no weighty reason can be urged for advocating the use of the Corsican fir, which, in all probability, would not in general prove such a profitable speculation as the rearing of our indigenous conifers.

ON SEPTIC, ANTHRAX OR CARBUNCULAR FEVERS AMONGST HORSES, CATTLE, SHEEP, AND PIGS.

By George Armatage, The Bank, Hertford.

[*Premium—Fifteen Sovereigns.*]

Under the above titles we recognise a large class of diseases widely distributed over the United Kingdom, and singularly fatal in character. It is also remarkable, that up to the present moment there appears to be little, if any, mitigation of their prevalence or severity, and medicine fails to arrest their course except in those animals that are apparently healthy, or are the least affected.

A study of the causes which are believed to produce anthrax fevers is not without its value to the stockowner; for, in relation to epizootic or contagious diseases of foreign origin, they rank next in their destructive character. By them many farms have become tenantless, and the occupiers reduced to the verge of ruin, from which alone numbers of districts have changed into corn-growing localities, the breeding and rearing of cattle being altogether relinquished. The subject is likewise valuable in a public point of view, for the questions of meat supply and its cost are of infinite importance to a nation like this, whose inhabitants depend so much upon the flesh of animals as an article of food.

The causes of anthrax lie in a series of local influences, which, separately or combined, are to be found in almost every district, and to this may be traced the general nature or wide-spread prevalence of the several forms of the affection. We shall proceed to enumerate the various leading causes, and also consider them more or less in detail.

Diet.—From the manner in which our cattle and sheep are supplied with food, there is no doubt whatever that much harm exists, and the production of anthrax in this country is considerably increased thereby. Owing to the general excellence of British soil, system of tillage, &c., food for stock is raised in large abundance, and from the want of a precise method it is often too lavishly furnished, particularly to those being fed indoors, and where the production of manure is held as an important object. Pastures are likewise heavily manured, and the result is a luxuriant crop, which feeds rapidly. Again, food, not only grain and the artificial kinds, but also the grass and herbage of pasturage, may be deficient in natural moisture, and thus providing an excess of nutritive elements to the blood, while the disposition to take necessary exercise is also proportionately diminished, a poisoned state of the blood is induced favourable to the development of the conditions which mark the special disease. One of the forms of anthrax peculiarly common to stall-fed cattle is known as splenic apoplexy—so called from the spleen being considerably enlarged, its substance engorged with blood, and not unfrequently disorganised and ruptured, occasioning sudden death in the most promising animals. It is also common among younger stock which graze upon the richer and drier herbage of high lands; and from similar causes, when the disposition to plethora is already present, we find cows in which the secretion of milk is nearly arrested are peculiarly liable to it.

In horses the production of such fevers from diet alone appears to be of rare occurrence.

Among sheep splenic apoplexy does not prevail so commonly in this country as in others, but in its place we have the formidable "braxy," so well known in the Highlands as resulting from a change from succulent grasses to the harder, drier, and often more nutritious kinds of food. Thus, after these animals are confined to the fold and have less exercise, the disease shows itself.

In young stock the same or similar conditions bring about another form of disease known as black-quarter, quarter-ill, black-leg, &c., and nothing proves so fertile in its production as the feeding of a rich pasture after the short keep of winter, although it must be admitted that towards autumn many deaths arise from a change from moist to dry herbage, or from valleys to higher lands, which amounts to the same thing.

From repeated observation, we are led to conclude that the food of our domesticated animals should very properly contain a proportion of moisture, in order to render them assimilable, and when by change of season or of food less succulent can be obtained, or highly nutritious food is necessarily resorted to, care should be observed in providing sufficient moisture by an

allowance of roots, and when practicable cut food—chaff—with bran moistened, or water may be given more abundantly. In the hill countries these measures are not so easily carried out, and hence the great mortality among sheep from braxy. It is, however, worthy of consideration, whether, at such times of necessary change of weather, where other kinds of food are substituted, and the animals are folded, some such precaution as already named might be adopted with advantage. The subject of exercise is also one which might be profitably taken into account.

The question of feeding domestic animals is one deserving the greatest attention, and should not be passed over, as it too frequently is. From investigations already made, we learn that disease arises most extensively from an over-nutritious diet as well as from an innutritious one ; and besides, change of season and locality bring about such differences in the constitution of natural herbage, grasses, &c., as to give rise to some disorder or disease among the stock which consume it. Food may not only be rich or nutritive, and therefore highly beneficial to a certain class of animals in one locality, but to those of another breed and place the same will prove absolutely poisonous. And it appears that this cause is so common, especially with reference to oil and cotton cakes, that death in a number of animals is sudden, and the reasonable supposition is that poison has been administered. The same thing happens among the young stock of many districts by the too indiscriminate use of good food in the early spring, after the short commons of winter. In other cases we have known anthrax to arise during summer and autumn, where, after the sudden setting in of hot weather, the pastures have been dried up, grass becoming scarce, and recourse has been made to old hay and oilcake to make up the deficiency. Under these circumstances, there is supplied with the food an excess of nitrogenised material, and a deficiency of natural moisture ; and during higher elevations of temperature there is much less demand for it than in winter, the result being those elements do not undergo the proper course of assimilation. Such material being passed into the blood does not fail to give rise to disorder. It is, in the first place, non-elaborated, or not sufficiently developed into tissue-forming substance ; and, secondly, it accumulates rapidly, because the natural disposition to inactivity at these times produces a corresponding suspension of all the organic functions ; there is no demand for muscle-producing elements, because muscles are not wasting by action, and excretory organs do not expel it from the system because they are inactive from the same causes. The blood is surcharged then with nitrogenous elements of food, and those are of a low state of elaboration, insufficient to the building up of the system,

and their presence constitutes no other than a decided condition of blood-disease or poisoning, the outward manifestations of which vary in accordance with surrounding influences and modification of causes.

Various attempts have been made to trace the origin of anthrax to the consumption of mouldy and inferior food; and, while we must admit that both are positively injurious in large quantities, as taken only by hungry and half-starved animals, yet we have not discovered anthrax to follow, but simply diseases of the digestive organs, as colic, &c. Thriving animals, and those in whom plethora or the disposition to make blood rapidly is present, do not descend as a rule to bad food; and, as they are the more common subjects of anthrax, we may look farther for a solution of the question of origin.

It has also been thought that certain forms of parasitical (cryptogamous) growths on fodder have possessed special powers in the origin of anthrax, and continental authors have diligently compiled their list of such; but, beyond proving the occurrence of intestinal disorders, they make no advance; while other animals fed for months upon such have escaped disease altogether.

There is little doubt that the entire danger attending diet consists in the excess of nutritious elements poured into the alimentary canal beyond the wants of the system, when, by reason of other and external causes, the functions are interfered with, and at a time when the system is most vigorous and active. A considerable amount of mischief has occurred during late years from the use of common salt, especially among sheep. To these animals, like the pig, it often proves a positive poison. The practice has been recommended on the ground of its power of promoting a sharp appetite and favouring the growth and development of animals. It is, however, a mistake to give it to those that are rapidly thriving and confined to the fold or yard, and to none is it more fatal than to ewes during pregnancy, and at the time of parturition, as seen in the affection known as "heaving pains."

Another form of anthrax fever, often due to high and condimental feeding, is the apoplexy of parturition, common to cows at the birth of their first or second calf. Experience now teaches that these diseases are more common than formerly in many districts; that they are more dependent upon a forced system of feeding than upon breeding itself; and by moderate care may be successfully prevented.

Water.—It does not appear that water generally possesses any particular influence in the production of the various forms of anthrax. When exceptions to this statement occur, they may be traced to the presence of some specific poison, medicinal salts,

or other agency capable of acting upon the blood. It is well known that cattle in many districts have access only to the water of ponds in the farm-yards, or immediate locality of such places, into which the washing and drainage of manure find their way, and yet no positive calamity can be traced to the practice. Doubtless much, nay most, of the solid matter is quickly deposited, and the supernatant fluid becomes an alkaline solution, from the presence of potash, soda, and even ammonia salts, which render it a more palatable drink than clear hard water, which they always refuse if the other is present.

The water of such ponds and stagnant ditches, &c., may, however, become highly injurious when, from the surrounding land, there is a drainage of solution containing the products of refuse material—animal and otherwise, which have resulted from decomposition or nitrification. This is a totally distinct condition from that previously mentioned. While in the first there is a foul looking fluid, it, however, possesses salts which are natural and necessary to the blood; but when the process of nitrification is going on, there is manufactured not only acid salts, such as nitrates of potash and soda, sulphates of lime, potash, magnesia, and soda, with nitric acid and more or less organic matter probably in a state of decomposition. Professor Voelcker found in one instance from a number of investigations, that one imperial gallon of such water contained 235 grains of solid matter composed of the salts already named, and although clear looking water it was really "very foul indeed."* It must not be understood that we encourage the use of the foul looking water of farmyard ponds for the horses and cattle. We are sure it frequently appears much worse than it is, for a small quantity of drainage will suffice to give a deep colour to a large body of water; yet nevertheless there may be a greater admixture of drainage than is suspected, and, in addition, for we can never be safe, the abundant elements of decomposition producing the worst forms of disease. In all cases cattle should have an abundant supply of clear, soft water for drinking, and when hard water only is obtained, the addition of a few grains per gallon of the carbonates of soda or potash will remedy all the defects which belong to it.

The *want* of water often proves very injurious to stock; and in no instances is it so plainly marked as when cattle are placed in stalls for feeding, and there supplied largely with oilcake, various kinds of meal, and few turnips; and also when they are turned out on marshy lands during the hottest months, grass being scarce and highly impregnated with manurial products, and the drains, ponds, or rivulets dry or stagnant. In the first we have all the essential conditions of blood-poisoning from

* Discussion: Royal Agricultural Society of England. July 9, 1862. *Journal.*

insufficiently transformed blood material, and in the second probably the direct transmission of the virus from the herbage upon which the animals subsist. From this cause the writer has witnessed several outbreaks of disease on marshy lands, and where previously for years anthrax has been known to occur at such periods.

Soil.—It is generally accepted as a difficult question to state where anthrax diseases do not occur in the United Kingdom. They are common to every county, yet there are localities in each where some of the forms are never seen, but this is not such a surprising fact when we enter into a lengthened examination of the numerous causes. The following extract from a Parliamentary report interestingly sets forth the general distribution of anthrax in Britain:—*

"In Great Britain and Ireland anthrax is the most fatal of all enzoötic disorders, spreading widely over the richest pastures of fertile valleys on the Old or New Red Sandstone formations; on the soil over the Lias of Somerset and Gloucester, on the crag forms of Norfolk and Suffolk, on the compact soil of the Oxford Clay in Oxfordshire, Wilts, and the county of Lincoln. In the counties of Edinburgh and Haddington we find it particularly prevalent, stretching from Dalkeith to the Lammermuir Hills; indeed, in the south of Scotland along the whole tract of Cambrian and Silurian rocks. The hills of Scotland and the pastures of great fertility intervening between them teem with cattle and sheep, amongst which there is a heavy mortality from the different forms of anthrax. The black-quarter of cattle, which is one of the worst characteristic forms of the disease, prevails to a great extent on the Old Red Sandstone of the counties of Ayr, Stirling, Perth, Forfar, and Kincardine. It is even seen in the same formation in the eastern portions of Banff, Inverness, and Caithness. It is common also in Kincardine and Aberdeen, prevailing, perhaps, as much in the Lower Silurian of the latter county, as on the same formation in Peebleshire and Berwickshire, and on the Igneous rocks of Renfrew and Kinross. Though I have here mentioned most of the formations on which the various forms of anthrax prevail, I must not omit to mention its ready development on the clays of Midlothian, Linlithgow, Lanark, and Renfrew. The soils on the Coal Measures, where not well drained, are also favourable to the development of anthrax in cattle; and although it may seem puzzling to state where carbuncular diseases do not occur, still it will be found not to occur to any great extent on the thin soil of the Upper Chalk, on the sand soils over the Greensand, on the Millstone Grit and Magnesian Limestone. Where the latter formations occur in Durham, Yorkshire, Derby-

* "Report on the Diseases of Live Stock, by Professor John Gamgee, in the Fifth Report of the Medical Officer of the Privy Council, 1862.

shire, Staffordshire, and Devon, the diseases, so far as I can ascertain, rarely occur.

" In Ireland anthrax prevails in all parts.

" In connection with the prevalence of anthrax diseases in the United Kingdom there are two remarkable facts; 1*stly*, That they are very widely distributed over the land, owing, probably, to the abundance of clay in its soils; 2*ndly*, This clayey nature of our soils renders them most profitable as pasture lands, owing to the expense attending their cultivation for other purposes; they require deep drainage, however, to ward off such diseases as anthrax and others, that depend not a little on moisture for their production."

From the prevalence of anthrax on low lying lands and marshes, as well as upon clayey soils and others of an undrained character, it was believed that malaria, the result of decomposing matter on the surface, had all to do with its production; it does not, however, follow that miasmatic vapours only are essential, as we know by experience that in many instances certain pastures are capable of producing the disease, while on others adjoining, and in every way apparently resembling them, it is never found. Indeed, anthrax prevails upon higher lands and calcareous soils, and, as already stated, it is difficult to say where it does not exist in one form or other. The evidences regarding the dependence of anthrax upon some particular geological formation or nature of soil is somewhat perplexing and conflicting. It seems to be most in keeping with all known phenomena that the malady should be the direct outcome of soils lying low, and subject to such influences that produce conditions the reverse of each other; and it is no less true that the most prolific sources are found in such localities. The soil there consists of animal, vegetable, and mineral matters, so arranged and constituted that the mass presents favourable qualifications for absorbing and retaining moisture, and at later periods, especially under intense heat or warm foggy weather, facilitating rapid decomposition. Soils possessing these characters are distinguished by the term *alluvial*, and form a considerable tract of land in the United Kingdom.

It is, however, interesting to notice that the paludal fevers of mankind are not restricted to soils of this nature entirely, and, in this respect, it appears there is considerable identity in the immediate causes of charbonous diseases both of man and animals. Sandy plains, loose gravelly soils, higher grounds in the vicinity of marshes, and rocky elevations, have been as conspicuous for these diseases as the most reputable lands and marshes of this or any other country. Such facts are not without their significance in directing a spirit of inquiry into probable causes outside of the usually acknowledged limits.

In pursuing our observations on the causes of anthrax in animals, it is not a difficult problem to understand that in connection with the soil there is present a remarkable power of disinfection, and manurial substances or decomposing matter are appropriated to the wants of vegetation, &c., up to a certain point. It is possible also that the presence or supply of decomposing matter may be in considerable excess, when the chemical properties are neutralised, and the vegetation growing thereon becomes saturated with putrescent elements derived directly from the surcharged soil. The deleterious properties of the soil are also intensified by heat. As the moisture is dried up, and the ground becomes parched on the surface, the poison which remains is concentrated, and whether it ascends as such into the organism of the plant, or as mephitic vapour, it is capable of transmitting to the blood of animals grazing thereupon a poison which is not only the result of decomposition or putrescence, but also communicates to the circulating fluid the same process or condition. Hence we distinguish those forms of anthrax fevers, common to marshy localities, as malignant or septic, because they are formidable maladies, being rarely curable, and reducing the body of the sufferer to a mass of putrefaction almost during life, and besides it is not confined to cattle and sheep, horses being quite as liable, and, through one or other, mankind also.

Just as the paludal fevers of the human race are found on some of the soils or localities of a high ground, so do we find anthrax among domestic animals. As the intense heat of summer may develop the malignant form on marshy lands, so may it give rise to splenic apoplexy in cattle and sheep on calcareous soils at considerable altitudes, and on strong and retentive soils, by no means liable to floods, the same conditions may develop black quarter among young stock. Similar results exist in many of the so-called "home pastures" and rich meadows of the valleys, where, as in the instances previously cited, the causes are almost identical, but very probably not so intense, the differences being dependent upon the quality of the manurial elements within the soil, as well as the constitution of the vegetation growing upon it. Marshy lands receive the former in excessive quantities by successive floods, and the constant presence of moisture renders such soil a prolific locale, under solar heat, of miasms which may pollute the blood through the process of respiration, while vegetation may either absorb the poison more rapidly during drought or become coated with putrescent substances ; other lands, on the contrary, are heavily manured by artificial means, and it appears to make little difference whether the manure is home made or of the artificial kind, for after repeated trials and change the disease still shows itself at the usual seasons of the year.

It must be admitted that the evidence of cause in the production of anthrax, either as malignant septic fevers, or as the milder forms of black-quarter, &c., upon soils and in localities apparently so widely different in their general characters, is very conflicting. It likewise appears very uncertain whether miasma can be looked upon as a never-failing cause; therefore, we must view with suspicion such conditions that are invariably present, as they are modified by temperature, drought and moisture, season, altitude, mode of culture, &c. Thus, for instance, all influences which promote decomposition, and, at the same time, tend to retain the elements of putrefaction unchanged, the soil being unable to appropriate the animal and vegetable substances which form the subjects of such chemical change, should receive greatest attention. Retentive soils, as clays, &c., and others having a non-porous substrata, require deep drainage; heavily manured pastures and lands may be benefited by lime-dressing, and in the higher localities, when food and water become respectively dry and scarce, and what also is not improbable, very inferior and impure, change of grazing ground should be made, and if artificial food is resorted to, it should be given sparingly at first, and liberal allowances of water ensured.

Before we quit this part of the subject it may be interesting to notice a few facts in reference to the prevalence of black-quarter among animals in North Leicestershire and borders of Derbyshire. A considerable tract of the lowland used as pasture consists of strong retentive soil in a bed of clay, very little of which is drained. It is exceedingly rich and fertile, and considerable sums of money are paid as rent. A bullock and a sheep are grazed upon each acre of land, and such is the well-known quality that these are fatted off twice in the year. The soil of the hills is very inferior, and as the young stock are transferred from high land to the luxuriant meadows without due caution, the mortality from black-quarter is often very extreme. Deep drainage of the meadows, and the moderate application of manures to the high limestone land, together with a sensible allowance of substantial food in winter to the young stock entirely averts these consequences.

Temperature.—Incidental allusions to this subject have already been made under previous heads, but we have yet to add a few other particulars with reference to heat and cold, &c. These cannot, however, be viewed always as direct causes of anthrax; they are doubtless not without great and powerful effects, but in all cases require the operation of other agencies. Thus warm, foggy weather seems highly favourable to the anthrax state, and from this being alike productive in the development of many forms of animal life, together with the fact that *bacteridæ* animalcules, are found in the blood and diseased vesicles of the

affected animals, it was considered likely that such was the cause. Besides this, when the said *bacteridæ* were dried and afterwards introduced to the blood of a healthy animal, anthrax was produced, but this only proved that the operation was analogous to application of the scab from the wound of the diseased to another on a healthy animal, a veritable inoculation with the direct poison, *bacteridæ* being present in the blood and diseased products of the higher animals when affected with anthrax, to all intents and purposes being likewise products and not the cause of disease.

Further observation has also established the fact, that anthrax will appear late in the season when cold nights come on and frosts appear. Just as a warm, close, and damp atmosphere interferes with the functions of the skin, producing an indisposition to take ordinary exercise, and thus limiting the course of elimination from the body of various hurtful ingredients, so will the action of cold be attended with equal injury, provided there be present the all-essential plethora and vigour of constitution already alluded to. Sudden changes of temperature are powerful agencies in the production of disease of many kinds, the forms of which vary in accordance with the state of the system at the time, together with surrounding conditions, but in no instance is it so remarkable as in anthrax diseases, where opposite conditions appear to possess such wonderful powers in producing results positively identical. Thus among the Highland sheep, when confined to the fold, a cold, frosty, moonlight night occasions the death of hundreds from braxy ; hot scorching days on the fen lands develop splenic apoplexy and malignant pustule, and the warm, foggy days and nights of early summer, as well as the cold nights of autumn succeeding hot sunny days, *cæteribus paribus* will give rise to black-quarter among our young stock.

Seasons.—Anthrax affections are greatly influenced by the seasons. Temperature alone is inoperative without the fulfilment of other conditions ; hence we find the spring and autumn months are highly favourable periods, from the usual changes that are made in the diet at those times, and when at the same juncture heat or cold and moisture, or sudden frosts, interfere with the systemic functions.

Then the abundance or scarcity of food as brought about by the character of seasons, and involving sudden changes from natural to artificial foods, and *vice versa*, alike determine the production of anthrax in some of its forms ; and great mischief often prevails in the early winter months from the excessive use of turnips and different meals, whereby it is sought to hasten the condition of sheep for the butcher, while similar treatment to ewes in the spring, and lambs when they first resort to feeding

from the trough and pasture, spreads confusion and dismay throughout many of the crack flocks of whole districts. In hot seasons also there is a great tendency for the development of anthrax through the dryness of the ground, especially in marshy countries and on moist ground heavily manured, such as retentive clays, or other heavy soils lying on solid substrata which do not admit of the infiltration of water. Excessive heat favours in a high degree the decomposition of substances upon or near the surface, and their admixture with the food ensures the contamination of the blood, from which charbonous states are most likely to become not only prevalent, but dangerous through inoculation to other animals, and also human beings. The low lands of Lincolnshire, in the writer's recollection, have suffered more than once from visitations of this kind.

System of Cultivation.—As the production of anthrax is mainly due to the richness of the food allowed, it is quite possible, we believe, by the application of artificial or other manures, to bring about such states in the soil as to entirely alter the character of the vegetation growing upon it, or, in more precise words, the food under heavy manuring acquires a higher nutritive value as well as being produced in greater quantity, and thus anthrax diseases may be generated where they have not hitherto been seen. This has been the result in several instances, and changes from artificial to farm-yard manures produce no mitigation of the effects. Under these conditions, that form known as splenic apoplexy is generated both among cattle and sheep, appearing suddenly and proving rapidly fatal to all that are attacked, few indeed escaping.

Ventilation and Drainage.—The want of pure air under all circumstances is a great obstruction to the healthy functions of animals, but combined influences are necessary for the production of anthrax fever through the agency of ill ventilation. That form most observed as a result of an impure atmosphere occurs chiefly among pigs, and is known as "typhoid fever," "red soldier," "cyanosis," and "blue disease." Close and ill-ventilated styes are fruitful sources when coupled with those conditions. Sewage gases find their way into the sleeping apartments, or the drainage of sewers becomes admixed with the wash supplied to the animals. Some years ago the attention of the writer was drawn to a large number of pigs suffering from this form of complaint, and after a careful investigation, it was ascertained that in the centre of each of the sleeping apartments of a newly-erected series of styes there was a drain guarded only by a simple grating. The straw for bedding was laid over this, and doubtless assisted very largely in diffusing the ascending miasmatic gases throughout the area. All the pigs were more or less affected, the worst dying within a few hours after being visited. The

rest were simply turned into the lanes and fields for food and exercise, during which the drains were closed, and they entirely recovered. At a large dairy farm in Sussex a valuable lot of pigs were seized and died. Others were purchased to fill their places and died also, and subsequently it was found that sewage matters had gained an entrance to the tank below-ground in which the wash food was stored.

Imperfect drainage of yards, &c., may lead to pollution of ponds, streams, reservoirs, wells, &c., from which the cattle obtain their drinking water; and in this way, especially during a hot summer, the water being rather scarce, a concentrated poison is conveyed alike destructive to horses as well as cattle and sheep, as proved in several instances during the summer of 1874 in the midland counties of England. It is doubtless from this cause—impure water or impregnation of the wash food with sewage matters, together with the effluvium from closed drains, as well as accumulations of decomposing matter within the styes, that so much of this form of anthrax fever in pigs arises. It is unknown where the animals are allowed their liberty, and have access only to pure water and cleanly food. The instances quoted by the writer are but isolated ones from an extensive experience, and are given only as examples of the origin of the affection which he has long received as admitted, rather than multiply the production of cases to support a proposition already accepted also by others.

A deficient or imperfect ventilation of buildings in which domestic animals are confined almost wholly without exercise, however, does not, *per se*, generate anthrax fever. The air may be very foul, and indeed so close as to destroy life rapidly or only very slowly, yet other conditions are essential for the full development of the various forms of disease under consideration. It is imperative that the air be impregnated with effluvia or exhalations, the products of decomposing animal and vegetable matters, which enter the blood by the lungs and communicate to it poisonous qualities, or in other words, entirely destroy its circulating and nutritive properties and render it totally unfit for the support of life. But it is doubtful if such a condition is a large or fruitful source of anthrax diseases generally. They are unquestionably largely produced by filth in one form or other, in combination with other causes, all of which, as experience fully proves, operate chiefly by means of the many facilities that are afforded for their direct entrance to the blood.

It may be profitable to consider this proposition in a common aspect. We know that on the earth's surface there are abundant sources of pollution by which the air is tainted throughout an immeasurable area, and it is positively unbearable, yet no hurtful consequences are known to arise. We owe the absence of harm

to the properties of dilution and disinfection which belong to the atmosphere in no slight degree; and although we must admit those properties may at times be present in less degree than at others, and overpowering heat before and after rain and fogs may intensify the pollution of the air, yet we believe we are not justified in pronouncing the entire origin of anthrax fevers to such states alone. It is during the continuance of excessive heat and occasional rains or prolonged droughts on marshy lands that these diseases sometimes arise very suddenly and rage with all the powers of a fatal epizoötic. The air is perceptibly tainted with noisome odours over certain areas, and there disease is doing its worst; while in all probability in the adjoining pasture, or certainly not very far distant, there are other cattle enduring apparently similar privations, such as scanty herbage, scarcity of water, &c., &c., and they are in good health. It appears the air of a district, although sensibly offensive, may not be the sole cause; indeed, it may have little to do with the production of some of the forms of the disease in question, for with its movement, powers of diffusion, dilution, and disinfection, its hurtful propensities are rapidly and largely diminished. Nevertheless, it may, nor do we doubt that it contains myriads of microscopical or invisible particles, the products of wholesale corruption going on within or upon the soil, and they doubtless assist in the work of blood pollution; but we are inclined to lay much more stress on the proposition that the products of decomposition mainly find their way into the blood by means of the food and water. This view is pre-eminently borne out by the course which the maladies run. Mere atmospheric influence could not, we think, produce such wide-spread and wholesale fatalities in so short a time. The blood is evidently the original seat of the disease, a septic condition being produced by the direct transmission to it of some of the material undergoing intense and perfect decomposition; indeed we might almost compare the results to wilful inoculation, and thus we have developed more speedy revelations than we believe can take place only through the medium of the atmosphere. This view is also borne out by the behaviour of the disease as it appears in those animals under confinement in an atmosphere rendered impure from decomposition of animal matters. Thousands of cattle are annually fed on manure which accumulates beneath them to the extent of many tons, and on which they rest and luxuriate, and thrive as well as they are expected up to their being slaughtered. Besides, this practice goes on for years on some farms without a casualty from anthrax, and, further, it continues still on others, and such a complaint has never been seen. Yet we cannot close our eyes to the fact that there is the very essence of putridity beneath, probably several feet in depth. There is certainly here enough filth

and decomposition to pollute the air and produce anthrax if it only needs the effluvia of such to enter the lungs. It is therefore clear something more is needed. If due care is exercised in allowing pure water and food in moderate quantity, all goes well; but once allow the products of decomposition to mix with the nourishment of which the animal partakes, then the most malignant form of anthrax fever will rapidly appear, and a likewise fatal modification, viz., splenic apoplexy, will succeed a continuance of heavy feeding on meals and oil-cake with few roots and no water, providing the animals take no exercise, even where the ventilation is as perfect as human minds can ensure it.

We have the additional fact before us, viz., that even during the existence of malignant anthrax in a herd confined to a particular pasture, other cattle in adjoining fields entirely escape, although conditions are to all appearances identical.

The part that deficient drainage plays consists in the production of a cold and wet surface, bearing but scanty food in winter and spring, and during warm weather vegetation is forced rapidly into growth, while the heat and moisture highly favours decomposition. The first acts upon the system powerfully. After the vicissitudes of winter the functions are suddenly called into severe work, and nutritious elements are plentifully supplied. The animal grazes long and breathes a polluted air which lies close to the ground, and the herbage is contaminated if not saturated with putrescent elements. As long as the land is perfectly dry or covered with water no harm usually arises. The poison—paludal or malarious poison—of marshy land is developed by decomposition under the influence of temperature higher than 60° F. and moisture within the soil. The action of the poison appears to be that of a depressant or sedative to the nervous system, and so interfering with the proper performance of the assimilative functions while the blood is corrupted or poisoned, and it becomes surcharged with all the elements of decomposition, constituting the so-called septic or putrid state.

Are the Septic or Anthrax Fevers Contagious?—If we rest merely upon the outward revelations which characterise these affections, we might, with apparent reason, answer this question in the affirmative. It must, however, be borne in mind that the suddenness of attack, rapid and malignant course, together with fatal terminations, are not necessarily the prominent features of a contagious malady. It is a well-known fact that few epizoötic affections possess even these qualifications, and, conversely, there are few enzoötic or indigenous and non-contagious diseases common to our domestic animals that do not possess most of them. Contagious diseases are propagated by the transmission of a morbid virus, which, in the case of those of foreign origin particularly, requires a certain length of time to develop within

the system before outward manifestations are produced, and from this the attacks are continuous and mostly in succession, prevailing for weeks and months, and ending only when there are no more animals to kill. Enzoötic or non-contagious maladies depend for their production upon the wide-spread nature of the cause. Of whatever nature that may be, it must exercise its influence upon all alike, and at the same time, in order to produce the general and simultaneous seizures which are so commonly witnessed in this country. The disease also depends entirely upon a cause quite independent of animals for its production; in other words, the death of one does not intensify the cause and render its operation more severe upon others. The production of the same or a similar malady by direct inoculation is, to all intents and purposes, an accidental and altogether foreign method, and must not be enumerated as one of the natural causes of anthrax; and if we exclude this, as it is thought we very properly should, and limit our question to anthrax disease, *sui generis*, we shall have no hesitation in treating it as purely a non-infectious malady. By this we mean that healthy animals do not contract the disease from the proximity, secretions, or excretions of others labouring under it, and as healthy and diseased may be confined in different parts of the same building, fed and treated altogether or separately, no transmission takes place. It is remarked that on certain pastures black-quarter commonly prevails at certain seasons, and on certain high lands sheep and young stock suffer from splenic apoplexy, but the animals of adjoining lands, separated only by a common hedge or simple post and rails, escape entirely. The sheep of the Highland farmer die of braxy after cold moonlight nights, where folded on rich turnips, &c., but the disease is probably almost unknown to the lowland farmer, who occupies the next holding. We find also the anthrax fever or typhus of pigs much more common to the uncleanly farms of Ireland than to other parts of Britain; the "blain" or *glos-anthrax** of cattle belongs only to certain districts, and parturient apoplexy of cattle, apoplexy of pigs, and heaving pains of ewes, depend more upon a system of feeding than anything else, for where attention is paid to this department, animals that are predisposed to these affections are wonderfully preserved.

From these statements we learn that certain specific conditions of soil, food, and system are necessary for the development of anthrax, and beyond the particular spots on which they are generated, they do not pass by means of the atmosphere, breath

* Glos-anthrax is observed to appear in localities where foot-and-mouth disease prevails; and probably we may be justified in viewing this form of anthrax as the result of a direct transmission of a blood poison in many instances—even anthrax poison it may be.

of animals, &c., &c. Such is the evidence obtained by close observation in this country, and daily increasing testimony of those well calculated to pronounce on the matter fully confirms the soundness of the conclusion.

There is, however, one source of great danger in some of the forms of anthrax occurring during excessively hot weather, being conveyed to other animals as well as human beings by direct inoculation. At such times, more particularly, the disease becomes highly contagious, and many serious results have already decided this part of the subject. The following examples are cited as evidences of the communicability of the anthrax poison :—

Margraff gives details in the *Wochenschrift für Thierheilkunde und Viehzucht*, 1859, an abstract of which is given in the "Edinburgh Veterinary Review" for 1859–60, p. 412. He says —"In the beginning of October 1857, an ox was taken ill, and the owner wishing to act as his own veterinary surgeon, thought he would avail of the animal's good condition and slaughter it. A butcher in the village dressed it, and, as usual, placed the knife repeatedly in his mouth. The man was seized with swollen lips, gums, and tongue, and the swelling extended so rapidly that it was almost impossible for him to swallow. A boy in attendance, when the animal was slaughtered, got some blood splashed on his cheek, which became the seat of a remarkable swelling.

"Two days afterwards, the same person had a cow taken ill, manifesting the same symptoms as the ox, only in a more severe form. The proprietor, as usual about the district, thought the cow had 'the blood,' which signifies a discharge of blood into the intestines, and he forced his arm up the rectum, removed fœces, and would have removed the blood had he found any in. The disease advanced rapidly, and the cow died. The proprietor, who had made the exploration, was seized with violent stabbing pain in the arm; small pustules formed, and the whole formed into a malignant ulcer. He began to vomit, could not stand, lost his appetite, and had severe fever. The swelling of the arm extended to the shoulder, neck, and chest. He was vigorously treated by the same doctor who attended the butcher, and recovered."

In an article which appeared in the "The Scottish Farmer," and reproduced at p. 371, Vol. VI., "Edinburgh Veterinary Review,' the effects of inoculation are thus set forth:—"In one case, a number of young cattle, recently put to grass and rapidly thriving, were bled in succession because one of their number had been attacked by black-quarter. Unfortunately the operator, ignorant of any reason to dread the result, bled the sick animal first, and immediately proceeded with the others. The conse-

quence was, that seven more died the same evening, the tumours having been rapidly developed on the neck and chest, spreading from the phlebotomy wound as a centre. In another instance, a shepherd skinned a bullock that had died the same morning of black-quarter, and later in the day castrated several litters of pigs. Although he had washed his hands, and taken a turn among his sheep in the interval, the result was that all the pigs operated on died.

"The potency of the poison does not seem destructible by the digestive fluid, since pigs and dogs partaking of the fresh blood, or other parts of affected animals, are seized with violent sickness, vomiting, and purging, and in many cases die."

Mr Robertson, M.R.C.V.S., in a paper* on Splenic Apoplexy, states that he has fed dogs and cats on the flesh of an ox slaughtered in the last stages of the disease, yet no bad consequences resulted. This simply proves that cats and dogs have a greater power of resisting the effects of such animal poisons, a qualification which eminently fits them for their office as scavengers, while the statement does not affect the question of the existence of an animal poison in anthrax fevers. Dr Crisp,† in an able paper on splenic apoplexy, quotes numerous instances of the poisonous condition of the blood and flesh of animals dying or slaughtered when affected with the disease, dogs, swine, and even birds dying in consequence. He believes the poison is such as to lose its virulence in a few days, for he gave the spleens of affected animals to dogs and ravens, and, notwithstanding, they remained healthy. Exposure to the atmosphere and thorough cooking destroys the poison, hence the immunity from disease attending the consumption by human beings of the flesh of animals slaughtered often in the last stages of black-quarter, braxy, parturient apoplexy, &c.

The reader will do well to consult Dr Crisp's paper on splenic apoplexy, in which incontrovertible testimony is given of the existence and virulence of an animal poison, alike dangerous to man and the lower animals. Besides this, there are scattered throughout the pages of the "Veterinarian," "Edinburgh Veterinary Review," "Recueil de Mèdicine Vétérinaire," as well as other continental periodicals devoted to veterinary matters, numerous articles corroborative of these facts, not only as regarding splenic apoplexy but the other forms of anthrax fever; and the writer might add many instances which, having come under his own observation, strongly confirm the previous statements. The following are selected:—

"A farmer, keeping only a few young animals, sustained each year loss from black-quarter. He ceased adopting any medical

* Edinr. Vety. Review, Vol. II., p. 235.

† Bath and West of England Agricultural Journal, 1864.

treatment, and had the animals slaughtered as soon as possible, and the best parts were sold to his men, who appeared to suffer no harm from the consumption of the meat after being cooked.

A butcher constantly employed in a large district in dressing the carcases of dead and dying animals, suffered much from swelling of the hand and arm, with fever and sickness, after flaying and cutting up some animals in the last stages of black quarter. It is supposed there were cuts or scratches on the hand or fingers, and these led to the absorption of the poison, from which he was unable to work for weeks. The consumption of the flesh of animals affected with black quarter, and even other forms of anthrax, is not at all uncommon ; and veterinarians can amply testify how largely parts of such animals have in late years found their way to the markets of our cities and towns from the provinces. As long as the blood can be induced to flow there is some chance of the meat having a fair colour, which in later stages and more acute cases is not so likely In the common form of disease, which, occurring at parturition, is known as parturient apoplexy, it is the common rule in many districts to slaughter before the unconscious state comes on, if possible, or even after it, and consign the flesh to some dead meat market. The writer has known great numbers of such cases, which may be but a tithe of what actually occurs, and other veterinarians have informed him it is their experience also.

Such facts open up a grave question concerning the welfare and safety of our population, the importance of which should not be underrated. Without attempting to press the point of the existence of a positive poison within the flesh and juices of animals slaughtered when suffering from anthrax fevers, are we not justified in believing such flesh is not as it ought to be ? And when we know the poorer part of the community are not remarkable for the best modes of cooking and habits of economy, that it is among them that such meat always finds its way, can we feel surprised that low fevers, boils, and carbuncles, &c., are so common ? It may be urged with equal justice and truth, that other causes for these are always present, but it does not mitigate the fact that all such flesh, after the existence of a blood disease like anthrax fever, is far from a healthy standard, and it fails to nourish the human body as it ought. It must be borne in mind the higher animal man needs a more elaborate food than brutes. Many of the lower grade live merely as consumers of refuse, to whom filth and poison is of little moment; but mankind requires food of the highest quality and perfection, without which he suffers in a variety of ways.

With reference to the consumption of the flesh and blood of animals dying from anthrax, it is well known that pigs rapidly

succumb; dogs and cats appear to possess a remarkable power of resisting the poison, yet nevertheless at times suffer very acutely from abdominal irritation, and not uncommonly die. In certain hot seasons when anthrax assumes a malignant form, horses, cattle, pigs, and dogs, fall victims from inoculation, the morbid poison gaining access to the system along with the grass on which blood, &c., may have been accidentally spilled, and the archives of foreign literature abound with numerous evidences of this. M. Dalac says its propagation may depend upon the emanations from diseased animals attached to the forage, and he records cases of malignant pustule in the human subject following contact with the bodies of sheep dying of splenic apoplexy, and concludes by referring to the medical men who attended the cases. He likewise gives a number of names of high veterinary and medical authorities who accept the consequence of contagion by contact with the bodies of animals dying of anthrax.*

In a report by Mr R. Ceely on the outbreak of anthrax fever at Swineshead, Lincolnshire,† we are favoured with facts having greater value on account of their reference to events in our vicinity. We are there informed the disease first appeared in some sheep, and subsequently some oxen grazing with them were attacked, and pigs which only passed over the ground were seized. The malady was confined to one field, which after a time was cleared, dressed with agricultural salt, and shut up for three weeks, at the end of which, two lots of beasts were put on to graze, and two out of the number were attacked in twenty-four hours. The horses escaped; dogs and pigs partaking of the warm blood of the dead oxen suffered no harm, and human beings ate the cooked flesh with safety. In other instances pigs fell ill and died after consuming the milk and offal of diseased animals, suffering from the peculiar form of anthrax known as *angina,* or throat disease. The report concludes with the following remarks:—

"The carcases of animals dying of *anthrax fever* ought to be immediately buried deeply in the soil, as much for the benefit of the owner as the safety of the public.

"The fatality of this disease, its communicability to all animals, and even to man under certain circumstances, would justify the most rigid legislative enactments, and claim increased vigilance and intelligence on the part of inspectors at slaughter-houses, markets, and fairs.

"The institution, and resolute supervision of public slaughter-houses, wherever practicable, would no doubt accomplish much in defence of the public interest. But there is a class of men

* Rec. de Med. Vet. 1860.

† Sixth report of the medical officer of the Privy Council, 1863.

actively occupied in the purchase and sale of diseased meat, whom present laws seem inadequate to restrain."

Professor Simonds* has witnessed death in pigs and dogs from eating the blood, entrails, and offal, of animals dying from splenic apoplexy.

Professor Gamgee† gives the particulars of an outbreak of anthrax disease in a bull, following which four pigs died from eating the entrails, two dogs suffered violently but recovered, and a man who slaughtered the bull contracted the disease by inoculation through a wound on his hand, and, as supported by the testimony of the surgeon who attended the case, died in consequence. In East Lothian a bullock was seized with the disease, slaughtered, and the carcase sent in a basket to market. The entrails had been given to pigs, which were taken ill, and several died. Mr Ceely, in the paper referred to, states that the disease appeared in Derbyshire, and a dog and some ferrets died after eating the offal. In Northamptonshire some pigs died after eating the spleen of a diseased ox, and thirteen others suffered severely after eating the offal. Some of these died, but others were slaughtered, and their carcases sent to London.

With regard to the safety in using the flesh of animals slaughtered when suffering from the disease, it depends upon certain circumstances: First, The animals should be slaughtered early, before the blood has become largely extravasated, so that the bodies may be drained as thoroughly as possible. The retention of blood within the carcase hastens the process of decomposition more completely than in many other diseases. If the animal does not bleed well, the flesh is not so safe for food. Second, Exposure to the atmosphere, as well as thorough cooking, destroys the poison within the flesh of animals slaughtered in the early stages of black-quarter and splenic apoplexy; but the flesh of those suffering from epizoötic, or malignant anthrax fever, and the various forms, accompanied with external eruptions, boils, pustules, or carbuncles, is decidedly unsafe. The flesh of swine labouring under mild forms of charbon peculiar to them, known as "red soldier," &c., together with that of cows in parturient apoplexy, and young stock in black-quarter, find their way into many of our large towns, all of which are safe only to the extent to which the previous blood-letting could be carried out, together with the subsequent cooking. There is, however, that about eating the flesh of animals known to be diseased, which is highly repugnant, to say the least, but we are inclined to go farther, and object to its use altogether. It is difficult to bring together facts which prove cases of direct injury from meat purchased in

* "Journal of Royal Agricultural Society."

† "Edinburgh Vet. Rev.," vol. 6, p. 164.

open market, and we do not believe it to be very likely that persons would subject themselves voluntarily to experiment on the question, yet we feel at liberty to state, on general grounds, our firm belief in the hurtfulness of the meat which even now finds its way, by special and appropriate channels, to the very poor of London, and all our large cities and towns.

With reference to one variety of disease mentioned in this paper—viz., "pig typhoid," or "hog cholera," some doubt has been entertained whether it may justly be recognised as a form of anthrax. The writer has followed what he has believed to be a correct course, and although *post mortem* revelations may be somewhat in opposition to the conclusion so long entertained, yet there are points in which identity may be observed. We have regarded it as an *anthracoid* disease, and this conclusion is strengthened by the fact that it sometimes prevails with, and runs into, other forms, as *carbuncular angina*, or "quinsy." *Carbuncular apoplexy*, and, in continental countries, a form of *glos anthrax*, known as *Stomanthrax Hordeolum*, ordinary "pig typhoid," or "hog cholera," we have long regarded as infectious, as the cohabitation of diseased with healthy pigs has repeatedly proved, and likewise the origin of cases where no cohabition being possible, the cause doubtless was due to human agency—persons in attendance having previously handled, or been in close proximity to, diseased animals. The writer is pleased to find his opinions verified by a lengthy account of "hog cholera," and a number of experiments by Professor Axe, which are contained in the "Veterinarian" for June, July, August, and September of the present year, besides further testing the matter by inoculation, and giving in support of the investigations of previous observers, that a certain period of 13 or 14 days elapses—the so-called period of latency, or incubation—between the time of known infection or inoculation and appearance of first signs.

This point being determined, it follows as a necessary course that provision should be made in all future Orders of Council relative to contagious diseases of animals for dealing with this; likewise in case of death after purchase, when this affection has been present, the question of liability may be definitely settled.

Propagation.—This is effected in various ways, being determined chiefly by the particular form of the malady. These will be referred to separately.

(a.) *Black-quarter*, *splenic apoplexy* of cattle and sheep, *braxy* of sheep, *parturient apoplexy* of cows, and *black spauld* or black-quarter of sheep, as we have attempted to show, are the result of a condition known as hypernutrition—a redundancy of blood in which the fibrinous elements particularly are excessive, and we must therefore look to the causes of plethora for the origin of

these diseases. Luxuriant pastures, particularly those near home, which consequently receive greater attention, and others liberally treated with manures, natural and artificial, are particularly dangerous to young stock in the spring when they are thriving rapidly, more especially after enduring a winter on short commons. The excessive use of artificial foods under similar conditions, or dry herbage of high lands, affect older cattle, and in proportion as water is withheld, common salt allowed, or confinement is enforced. Whatever tends to hasten plethora in animals should be jealously watched, that means for counteracting excessive states may be timely adopted. A sharp appetite and an amount of necessary movement will amply effect all this.

When black quarter, &c., is discovered on clay soils, or such as possess an impenetrable substratum which prevents the infiltration of the surface water, the mode of propagation may be somewhat more complex. In the winter time the herbage is very likely to be scanty, and in the spring it rapidly shoots up in consequence of the ever-prevailing moisture, favourable warm weather, and genial showers; and, in addition, as the animal quickly thrives, it may not be improbable that, under such circumstances, from the putrefaction of substances in contact with the earth's surface, some morbid ferment may be communicated to the blood. Such, however, cannot be insisted upon, as additional evidence is required; and while we cannot set down all soils of the above-named character in the category of marshy grounds, there is some amount of encouragement in assuming that some at least of the essentials are present. Such land requires deep drainage, and when this is done, black-quarter never fails to disappear.

(b.) *Malignant Anthrax or Anthrax Fever.*—In this form of disease, which doubtless depends upon a septic (putrid) condition of the blood, the means of propagation are (*a*) Excessive heat and drought on highly manured lands, particularly those in marshy localities, favouring the extensive decomposition of animal matter on the soil; conditions which are aggravated immediately before and after rains. (*b*) Impure water, or such as contains organic material undergoing decomposition, as drainage from polluted soil, sewage matters, &c. (*c*) Defective buildings rendered unfit as habitations by foul air, the emanations from drains, manure, &c. (*d*) Food undergoing decay, or saturated with putrescent elements. (*e*) Contagion or contact with the morbid products of the disease in affected animals—inoculation. This may arise accidentally by the fluids, blood, or secretions, &c., being spilled over the herbage of pastures, thrown into ponds, or directly to other animals. Another source of contagion is to be found in the numerous flies and insects which may

convey the poison by their soiled wings and feet, and others, as the gad-fly, which, having piercing probosces, first suck the juices from dead carcases and afterwards insert the organ into the skin of healthy animals. Where the disease suddenly appears at some distance from the original spot, in hot seasons, it is not unlikely this insect may have much to do with it.

Hog cholera we believe to be an infectious disease, and therefore is propagated by the atmosphere, which becomes charged in the vicinity with the elements of the morbid poison. The natural properties of the atmosphere, however, very much limit this mode of conveyance, and where that fails over long distances, it is unquestionably very possible for the disease to be communicated by the clothes, hands, boots, &c., of those who go from one to the other, likewise by fodder, infected styes, &c. Proper cleanliness and disinfection, however, readily puts an end to this mode of propagation. The natural means are those which first give rise to the disease, viz., sewage gases, admixture of sewage matters with the food, and other causes which depress the nervous system and pollute the blood.

Allied Diseases in Man.—The annals of plagues and pestilences in man and the lower animals are prolific in details which testify of the existence of anthrax diseases from times most remote, and also of their communicability to man. It would be impossible to treat this part of the subject in an exhaustive manner within the scope of a dissertation like the present; therefore, we shall limit the statements to those of general character. In continental countries, anthrax diseases, known in France as "charbon," "quartier," and "sang," and in Germany as "milzbrand," have largely prevailed; and by reason of the presence of the special causes, to a much greater degree than in our own country, they have assumed the character of epizoötics, committing frightful havoc and proving deadly to mankind from direct inoculation. From recent observations, it is believed that one of the forms of anthrax in man, viz., malignant pustule, has been much more common in Britain than has been supposed, the identity of which, as stated by Dr Wm. Budd,* is satisfactorily proved by the fact that the affection, as it appears in man, may be transmitted to the animal by inoculation. The disease in man is characterised by a redness of the skin at the point where contact with the morbid poison was made. The appearances are first not unlike those produced by a gnat, shortly followed by the formation of a small vesicle, and at a later period a gangrenous inflammation sets in, which rapidly enlarges and spreads from the original point, involving a larger area of tissue. The parts next become hard and black, and are then dead. If cut with the knife no pain is felt, and a creaking sound is emitted. Around the

* "British Medical Journal," 1863.

affected part a second crop of vesicles form, and the skin assumes an erysipelatous condition, and in this way fresh areas of tissues are invaded, during which the absorbents in the neighbourhood become inflamed from the conveyance of the multiplying poison; the breath also becomes fœtid, and death rapidly follows with all the evidences of a septic or putrid blood poisoning.

The disease is communicated in various ways. (*a*) By direct inoculation, more particularly to those who are employed to cut up the carcases of animals affected with anthrax. It does not appear that an open wound, scratch, or abrasion of the skin are essential for perfect inoculation, as instances are on record that blood falling upon the face or any uncovered skin have produced all the effects as we have described. (*b*) The flesh of diseased animals improperly cooked will convey the disease malignant pustule to man, while other animals of the same and different species, as the horse, deer, sheep, pig, and dog, contract a rapid and fatal form of blood poisoning, probably through absorption from the surface of mucous membranes. There are, however, exceptions to these statements, as, for instance, when the flesh of certain animals has been allowed to remain exposed to the air or thoroughly cooked, the poison appears to have been destroyed. Such, however, require confirmation before we can recommend the use of such flesh as animal food for man. It is related by Trousseau that twenty-six persons died in ten years from malignant pustule contracted during the working up of horse hair, which had been imported from Buenos Ayres. Dr Budd also states that the virus of the disease, when in a dried state, will retain its properties for an indefinite time, thus the hair, hoofs, horns, flesh, fat, and tallow of animals which have died of "charbon" may communicate malignant pustule to man. (*c*) Insects, especially such as are provided with probosces, as gad flies, may convey the disease, first sucking the flesh, offal, &c., of affected cattle, &c., and afterwards piercing the skin of man; and flies, by simply alighting, may convey it by soiled wings and feet.

There is likewise a great similarity in some of the forms of disease in man which result from paludal (marsh) poisoning and certain anthrax maladies of animals. They are, however, not common in Britain. In other countries, as India, chiefly owing to the undrained and malarious character of the soil, morbid alterations of the structure of the liver and spleen are prevalent. The latter organ has been found to be so enlarged as to weigh from ten to thirty pounds, and sometimes to be a mere bag of blood, signs which bear some resemblance to the splenic apoplexy of cattle and sheep.

In the disease of swine known as hog cholera, otherwise *typhus, erysipelas carbunculosum, gastro-enteritis*, &c., and vul-

garly as the "blue disease," "distemper," "red-soldier," there is not a little resemblance to the typhus fever of man. Just as the latter arises from filth, bad ventilation, and overcrowding, so may the disease hog-cholera be engendered. The general description of the character of the rubeoloid rash or eruption also mainly corroborates the appearances as witnessed in the pig. In the early stages the spots are flattened on the surface, have no well-defined outline, and fade insensibly into the colour of the surrounding skin. The colour likewise disappears on pressure. At later stages the spots assume a darker colour, which does not disappear but only fades on pressure, and as time advances they become dark purple. They are likewise so numerous as to run into each other, and thus involve greater part of the surface of the body.

The condition of internal states also bears a close resemblance in the two cases, giving rise to outward signs of similar character and order; death being usually preceded by coma as a result of blood-poisoning, or syncope from failure of the heart's action, due to the same cause. In the morbid anatomy the analogy is not so complete; the appearances are, on the other hand, characteristic of *typhoid fever*, and consist of congestion of the mucous membrane of the intestines, especially in the neighbourhood of the solitary and Peyer's glands, prominence through increased growth of the gland cells, softening of the contents, elimination and ulceration, &c.

In the *glos-anthrax* or "blain" of cattle and sheep there may be discovered some analogy to the malignant or putrid sore throat in man, now identified as a form of scarlet fever. When these diseases arise spontaneously in both subjects, it appears to be due to some external cause engendered by soil, climate, moisture, and other malarious influences operating upon a peculiar state of the system, the symptoms of which coincide very faithfully.

In man the signs are somewhat as follow:—In the milder forms the scarlet rash is not always visible, but petechiæ are often seen, and the attendant fever is of a low typhoid character. At other times the patient suffers suddenly from a septic, typhoid, and malignant fever of extreme virulence, followed closely by great prostration, irregular pulse, short, quick, and difficult breathing, and raving, stupor, or coma. The tongue is furred and of a dark brown colour, cheeks flushed, eyes suffused, aphthous elevations appear in the throat, and are surrounded by a dark, livid base, which, shortly bursting, expose a dark, raw surface of a gangrenous character. The air passages and fauces are clogged with a viscid mucus, which increases the pain and difficulty of breathing as well as swallowing, and acrid, sanious discharges flow from the nostrils, &c., which blister and excoriate

all the surfaces over which they pass. The patient may be carried off within two days from the attack, milder cases extend to a week, and others lingering beyond this time die from a complication of the local manifestations in various parts and organs of the body.

Glos-anthrax of cattle and sheep usually appears very suddenly without the exhibition of previous signs of systemic disturbance. Sometimes it has been thought the introduction of the morbid poison may be traced to the existence of other forms of anthrax, or foot-and-mouth disease, in the immediate neighbourhood, when the grass or other food may be tainted with the products of one of these diseases. If this conclusion is correct, we may regard *glos-anthrax* as a septic form of carbuncular diseases due to a variety of inoculation. Constitutional disturbance is evident at once, followed by extreme depression, stupor, or the animal is wild and frantic, and shortly becomes comatose. The mouth, tongue, and fauces are swollen and of a dark, livid colour, and a copious discharge of limpid saliva flows first, which shortly becomes purulent and bloody. The mucous surfaces are involved in a general inflammation, and a large crop of pustules appear, which, after bursting, expose excoriations which are angry and gangrenous in appearance, the surrounding tissues growing darker as the disease advances. The swelling increases, and includes the nose, face, and neck, and death usually takes place in about thirty-six hours. A *post mortem* examination establishes the character of the affection ; it discloses extravasations of blood among the tissues, ecchymosis and blood stains, with effusion of fluid in the serous cavities, and rapid decomposition of the body. The local signs comprise extreme swelling of the tongue and fauces, with sloughing of the membrane, and more or less gangrene and even mortification, while the surrounding tissues are implicated in considerable swelling from sub-cutaneous dropsy or extravasation of fluid.

In order to render this part of the subject more useful and intelligible, further investigation is required. There is much yet to be cleared up by patient observation and careful study, and not the least valuable part of the resulting information will be the light thrown on the prevalence of certain diseases in mankind, as influenced by those of animals, particularly some diseases of a pandemic nature, which may possibly be found to arise from the quality of the flesh food which finds its way to the shops of our large towns and cities.

An equally important branch of information, much needed by the agriculturist, is that which directs him to the *prevention* of anthrax diseases. They are not, as a rule, capable of cure, but precautionary measures are usually simple, readily understood, and, for the most part, practicable. As repeated observa-

tions and investigations are made, this branch will be more appreciated, realising an immense annual saving, not only to the pockets of the farmer, but also to the general health of the population.

ON THE PINUS PINASTER OR CLUSTER PINE.

By Robert Hutchison of Carlowrie, Kirkliston.

[*Premium—Five Sovereigns.*]

Pinus Pinaster, Aiton, the star, or Cluster Pine.
Syn. :—*Pinus Massoniana*, Lambert.
„ *maritima*, Lamarck, Knight.
„ *nepalensis*, Royle.
„ *japonica*, Loudon.
„ *Latteri*, Madden.
„ *chinensis*, Knight.

Leaves, in twos, dark green, from 6 inches to 10 inches in length, from medium-sized sheaths, rigid, stout, broad, and slightly serrated on the margins; densely clustered on the branches in whorls. *Sheaths*, imbricated, yellowish when young, but becoming nearly black when old.

Buds.—Three quarters of an inch long, white, woolly, and non-resinous, with the scales recurved at the points.

Cones.—From 4 to 6 inches long, and 2½ inches wide at the broadest part, which is below the middle; conical; sessile; clustered; with broad, ash-coloured pyramidal scales that terminate in a small sharp point; of a light shining brown colour; the clusters generally contain from four to eight in number, but sometimes more.

Seeds.—Oblong; medium; with large wings about 1½ inch long, and ½ inch broad.

Cotyledons.—From seven to eight in number.

Branches.—In whorls, stout, with rather long, imbricated, pointed, woolly buds.

This striking and interesting member of the coniferous family is generally believed to have been first introduced into this country by Gerard, about the year 1596. It has not, however, attained a great popularity, or been very extensively planted in any of the pine-growing localities of Britain, although in some isolated instances good specimens of large dimensions are to be found.

The native habitats of the *Pinus Pinaster* extend over a very wide geographical area, and embrace countries varying much from one another, both in point of soil, altitude, situation, &c., so that probably owing to this cause, it is that we find so

many of the authorities upon nomenclature, giving it a different specific name. Probably no other *Pinus* has so many synonyms. No fewer than twelve distinct names are quoted in the various systematic and descriptive accounts of the pine itself; while we can also reckon, amongst its four distinct varieties, *Pinus Pinaster Hamiltonii* (Tenore); *Pinus Pinaster Lemoniana* (Loudon); *Pinus Pinaster minor* (Loudon); and *Pinus Pinaster variegata;* a list of twelve synonyms. This, as we have already alluded to, is owing to the diversities in the growth of the species, under various modifications of situation, soil, climate, or altitude in different countries. It abounds in the sandy flats along the lower ranges of the Appennines, and to the north of these mountains. In upper Italy it is found at an altitude of 3000 feet above sea-level. It extends its native haunts to Spain and Portugal in the west, and all along the coast of France bounding the Mediterranean, as far eastward as the shores of Turkey. It has also been found in China, Japan, St Helena, New Zealand, and New Holland; but it is quite possible that, as we have no very early record of its having been observed in these Eastern latitudes, it may have been carried thither from its European habitats, where it is much more generally diffused, and attains to a greater size than it is found to do in China or Japan. It has been found in isolated spots in some of the northern provinces of India, although not to any considerable extent, but of exactly such a type in every botanical essential, as to class it as identical with the forms of *P. Pinaster*, found in the habitats both of Europe and the far East.

It has been introduced into America, but even with all possible care, it is considered there exceedingly unsatisfactory, and cannot be depended upon in the northern and middle states. Indeed, the success of the *Pinus Pinaster* in any new locality is dependent upon several considerations, which a recollection of the conditions under which it is found in its native habitats will at once explain. Although sufficiently hardy to withstand the vicissitudes of the British climate, being of a species which prefers a lower zone or altitude to that of its well-known congeners, the *P. Laricio, P. austriaca*, and *P. sylvestris;* and bearing with absolute impunity the salt-charged atmosphere of the sea coast, it will be found that the Pinaster in this country succeeds best in a situation exposed to a westerly or south-westerly wind, in sandy soil, and by the sea coast, or at a low altitude. Such a site is far more suited to its requirements for successful growth than even a richer soil, if it be subjected to the cold easterly winds, which are so often chilly and frosty, and consequently injurious in their effects to its foliage and young shoots. In this respect, it will be at once seen that the Pinaster is not so well adapted for universal or general propagation in

Britain. In some localities, however, it is invaluable; and in these or similar places its more extensive introduction for special purposes is well worthy of attention. These positions are low, flat, sandy stretches along the shore, exposed to the west or south west, where many descriptions of trees, both hard-wooded or coniferous, whose peculiar constitutions do not render them so well adapted to withstand the salt spray-charged air and breezes of the sea coast, are benefited by the free use of the Pinaster planted among them for nurses. Planted as an outer belt to such plantations, the screen afforded by the *P. Pinaster*, which thrives and luxuriates in the briny-laden atmosphere, is far more effectual than that of a solid stone wall. Indeed, it may be doubted whether a wall is of much assistance in these situations as a wind-screen, for it is well known that beyond the immediate and close proximity of the side of the wall itself, the trees of a plantation suffer more from the peculiar re-action of the blast after striking against the wall, termed "back-wind;" and which seems, rising obliquely over the wall, to recurve and dash with increased energy along the plantation.

A very good illustration of the effects produced upon trees by the action of sea breezes, and of the beneficial and advantageous use of Pinasters as a screen, may be instanced at Gosford, on the coast of East Lothian, between Longniddry and Aberlady, where the closely planted nurses themselves seem as if switched across with a hedge-bill from the outer side, each row of trees gradually acquiring taller proportions, as it is situated further inland, and the whole top of this dense belt presenting the appearance of a very broad sloping hedge. Immediately within this sheltering zone, however, although still quite near the shore, trees of all kinds, deciduous and evergreen, hard wood and coniferous, thrive well, and acquire considerable size and bole. On the shores of the Bristol Channel there are also to be seen instances of the value of Pinaster as a tree well suited to foster the development of other timber trees in such trying situations. Again, at Dunskey, between Portpatrick and Stranraer, the Pinaster has been largely planted for shelter to inner plantation belts, and there it thrives remarkably well; but in the immediate vicinity of that locality, planted upon higher ground, it does not succeed so well; and, generally speaking, in Wigtownshire, and along that coast, the suitability of the Pinaster noticeably declines with the increase of altitude in which it may be placed, presenting in the higher inland sites a marked peculiarity of tenderness and susceptibility to suffer from frost. Indeed it may be said generally in regard to the more extended introduction of the Pinaster in Scotland, that it is safer to use the Scots fir or the *Pinus Laricio* as a nurse for plantations where the altitudes exceed 300 feet, than to employ the Pinaster; while

for low-lying situations, whether in heavy or light soil, the Pinaster or the *Pinus austriaca* are preferable to Scots fir.

The effects of the alteration of situation upon the economic value of timber, are more distinctly observable in the case of the Pinaster than in any other tree of the coniferous family. In this respect, it has been noticed that the quality of the timber of this pine grown on the island of St Helena is far superior to that grown from the same strain in other and less insular positions. General Beatson, writing to Sir John Sinclair in 1811, first observed and called attention to this peculiarity, and it has since been frequently noticed that wood of the Pinaster grown in proximity to sea breezes is always of better quality than when grown under other circumstances.

The great suitability of the *Pinus Pinaster* for planting in sandy downs by the sea shore, removed from the influence of frosty spring winds from the east, has been acknowledged and satisfactorily tested, by the success which has attended the introduction and extensive planting of this pine along many tracts of the sea coast on the south of France, the Landes of Bordeaux, and between the latter city and Bayonne. The achievement of M. Bremontier, director of the Forest Administration of France, are matters of history, and are too well known to arboriculturists to require to be detailed here. Suffice it to say, that in the interests of his government, between the years 1789 and 1809, he had succeeded in transforming 12,500 acres of waste, barren, drifting sandbanks into thriving plantations, through the medium of the *Pinus Pinaster;* and although the value of the timber grown, owing to the inferior quality of this species, forms no great revenue, still the produce of the woodlands in the shape of tar, resin, and other oleaginous extracts from the wood, form the staple commerce and source of sustenance of the inhabitants; while a great national boon has been conferred on the country, and posterity has been shown how energy properly directed by the right selection of the best adapted species for the given site, will triumph over tremendous odds, and even in the face of the opposing forces of nature.

It will thus be seen that the soil of all others best adapted for the healthy culture to advantage of the *Pinus Pinaster* is a deep soil of a light sandy nature; and we have seen that with careful attention to its proper protection, it thrives even in pure sand. It will also succeed well in a light loam of friable texture, and indeed it is not particularly averse to any soil which is not too heavy or clayey.

The peculiarity of its roots, which differ from many of the coniferous genera (which are frequently shallow-rooted), is, that although the roots of the Pinaster are less spreading in their habit, and are, at the same time, less numerous than those of

most pines, they are also more of the "tap-root" type, and of a deep descending habit, which is well suited to give the tree a firm hold of the understrata in so shifting and light a soil as sand. From the same peculiarity of tap-rooted formations—like so many digital, bulky underground branches,—the tree is less adapted for rapidly penetrating heavy or stiff clay soil, or where the subsoil is rock; and in such situations, from the young trees being swayed by winds before their roots have got a sufficiently deep hold of the ground, the plants get generally "*winded*" as it is termed, *i.e.*, inclined to one side, according to the prevailing direction of the wind from one quarter or another. In rich soil, with a close clay subsoil, the roots of the *Pinus Pinaster* are apt to become succulent, which leads to the production of a very inferior quality of timber—a state of matters which the *P. Pinaster* can very well afford to dispense with, for even at the best, and under the most favoured circumstances, its timber cannot be said to be of good quality, but coarse, and brittle, and is not of long duration for economic or constructive purposes.

In a suitable soil, the growth of the Pinaster is rapid, attaining in the course of fifty years to about sixty feet in height, with a bole of corresponding proportion in thickness; but, to do it justice, the Pinaster requires a free open space around it;—hence it is less suited for planting in mixed plantations, excepting on the very margins, and even there its love of air and freedom will show itself, by an undue growth towards the exposed side, while the other, next the plantation, will in a few years become perfectly bare, alike leafless and branchless. In open spaces, as a tree of position, when grown in suitable soil, the *P. Pinaster* becomes very soon an ornamental tree of great beauty, and of a fine bold appearance, its light green foliage, thickly clustered towards the tips of the branches, being the more conspicuous by the bare stems of the younger wood,—a habit peculiar to this pine, which is rendered the more striking when the tree is covered with cones. These are placed in whorls round the stem of the branches, pointing outwards in a star-like group or cluster, whence the name of the species is derived—"*Pinaster*" or star pine. The cones are not matured till the autumn of the second year, and from at first being of a beautiful purplish green tint, gradually changing to a deep green, they assume when ripe a dark rich glossy brown hue, which, when lighted up by the rays of the autumnal setting sun, is very pleasing, picturesque, and highly ornamental.

The unsuitability of the *Pinus Pinaster* for successfully grouping with other trees in mixed plantations has, to a great extent, prevented its general introduction to anything like the popularity which many others of the same family have acquired

in this country. There are, however, good examples to be found growing at Twizell, near Belford, on the Northumberland coast, where it has long been grown and appreciated for sea-side planting. Other examples are to be found, as large timber trees, at Hopetoun, Linlithgowshire, on the banks of the Forth; at Dalmeny Park, near Cramond, quite close to the tide of the Forth; also at Donibristle, on the Fifeshire shore; at Dysart House, and at Raith, where it luxuriates quite close by the sea margin. It has been planted in some places (Stonefield) along the western shores of Argyllshire, and even in the extreme Hebrides, we find it thriving as a hedge or wind-fence against the blasts of the Atlantic.

Three remarkable examples of this pine, and which may almost be regarded as *historical* trees, occur in the manse garden at Moffat, in Dumfries-shire. They are better known by the name of "*the Pouch Trees.*" They are now of very quaint picturesque appearance, and are about 50 feet in height, one having a girth of 8 feet 6 inches at 3 feet from the ground. The history of their introduction to the garden at Moffat is perhaps already too well known to admit of being given here, but it may be briefly stated that they were planted by the late Dr Walker, Professor of Natural History in Edinburgh University, who enjoyed at the same time the incumbency of the parish of Moffat. An enthusiastic botanist and tree-lover, he had been presented with some seedlings of the *P. maritima* or *Pinaster,* as a great novelty and acquisition, and carefully placing them in the capacious pockets of his overcoat, with his precious cargo so secured, he performed the journey from Edinburgh to Moffat on horseback to attend to his parochial ministrations. Being observed by some of his criticising parishioners with the odd projections from his coat pockets, the trees when planted in the Manse Garden acquired the appellation of "*the Pouch Trees*" (pouch being Scotch for pocket), a name by which they have ever since been known, and probably will continue to be much more fittingly described than by that of their legitimate cognomen, Pinaster.

At Rossie Priory, in Perthshire, the *Pinus Pinaster* does not appear to succeed well, the only remaining specimen having been cut down recently on account of its declining condition. Excepting a few branches at the top, it was quite bare, and did not seem to enjoy its situation. It was 30 years old, but was not more than 14 feet in height, with a diameter of trunk at base of only 9 inches. The soil in this instance, is variable, and the subsoil in some places hard till, and in others loose sandy gravel; the surface being on a slope, the soil is naturally dry. At Durris, Kincardineshire, the Pinaster thrives well upon a free, open, porous granite soil, with gravelly subsoil, and in a northern

exposure. Plants introduced twelve years ago are now over twelve feet in height, and have a circumference, at 1 foot from the ground, of 12 inches. Last season's growth measured, in some instances, 15 inches. In the north of Scotland generally, the Pinaster has not been very widely introduced. Most of the examples of it to be met with are quite young trees. Many foresters object to it from its difficulty in bearing being transplanted with safety. This arises from its tap-rooted tendency, to which reference has already been made. But this objection can be quite easily overcome by planting the young trees out into plantation ground from the nursery where reared, while still small,—say from the two-year seed-bed. There are few specimens of *P. Pinaster* in Scotland of a cone-bearing age and size. Some good large trees are occasionally to be stumbled upon in individual positions, but not grown or massed together for timber purposes. For example, at Hopetoun, Linlithgowshire; growing near the coast of the Forth, there is a fine tree, 33 feet in height, and 42 inches in girth, at 3 feet from the ground, 34 inches at 8 feet up, and 21 inches at 16 feet up. It is 25 years old, and is grown in light soil, of a loamy nature, and with a gravelly subsoil. It is exposed to the south, and is well sheltered from the east wind. At Muirhouse, in Midlothian, to the west of Granton, and in a position quite within the influence of the sea breeze, there are good specimens of Pinaster, as follows:—

No. 1, 25 ft.	in height,	girth at	1 ft. up,	4 ft. 10½ ;	at 3 ft.	4 ft. 9 in.
No. 2, 30 ft.	„	„	„	5 ft. 10 ;	„	5 ft. 2 „
No. 3, 30 ft.	„	„	„	5 ft. 3½ ;	„	5 ft. 2 „

In this instance, the soil is *sand* for many feet deep; the altitude is simply sea-level; the exposure is to the north and east, and the trees are sheltered from the strong inland west winds, but stand within a few feet of high water when there are spring tides. Some of this species in this locality have recently died rather suddenly, and from no apparent cause; probably owing to the tap-roots having now penetrated the sand, and found an uncongenial substratum of clay or rock, the spongioles of the rootlets have got waterlogged or killed, and thus caused the death of the trees.

At Brodie Castle, Nairnshire, there is a fine thriving and healthy specimen of *Pinus Pinaster*, 36 feet in height, 4 feet 6 inches in girth at 1 foot from the ground, and 4 feet 3 inches at 5 feet up, and which has been planted for thirty-three years. It is grown in a very sandy loam, with sand subsoil, and is in a low-lying situation.

In England, the Pinaster of large size is much more generally found than in Scotland, but even there its introduction has not

been what may be called general. At Bourne Park, Canterbury, some fine examples are extant, and quite recently, to the grief of its enthusiastic owner—a true lover of the picturesque in arboriculture (Mr M. Bell),—one of the finest specimens died gradually—presumably from natural decay. This fine tree measured at the butt 10 feet 6 inches in circumference, and had a clear stem of 55 feet in height from the ground to the first fork, and a beautiful "*mushroom*" head—like old trees of the same species in the south of Italy. The rays of annual growth were tolerably distinct, and from these its age was estimated at 150 years. The wood was soft, but probably more so from decay than from natural character. In this instance, the situation is about 12 miles from the sea, in a valley. The soil is a deep loam, on a chalk subsoil. Near Norwich, and along the Yarmouth coast it has been extensively and most successfully introduced for many years.

In Ireland, it has been planted more freely than in Scotland, and it seems to succeed in that climate (beloved by pines generally) very well. It should be stated that the *Pinus Pinaster* is particularly liable to the attack of insects,—the *Hylurgus piniperda* and other pine beetles being specially attached to it, and frequently cause it much damage.

The season of the year best adapted for planting the *P. Pinaster* in situations of a sandy nature, and near the influence of sea breezes, is in the spring, probably in the end of the month of March. If planted then, the tap-roots, before referred to, have a fair chance of striking down into, and acquiring a firm hold of the substrata, and of establishing themselves securely, without risk of being displaced by the wind in their new situations, before the approach of the winter's blasts and storms.

Having thus cursorily noticed the peculiarities of the *Pinus Pinaster*, and its general characteristic features, and the condition essential for its most successful culture, it appears that it is one of the best adapted trees for sea-side cultivation, as well as being also an object of admiration in position as a single tree, and there can, doubtless, be but one opinion regarding its value, which ought to be stated ere this treatise is closed.

Unless upon soils and in situations thoroughly suited in every respect to its peculiarities, or unless as a specimen tree for variety, in will be found far more advantageous and profitable to substitute some of the other many species of a similar type in respect of foliage, stature, and massive outline for effect—such, for example, as the *Pinus Laricio* (Corsican Pine), *Pinus austriaca*, *Pinus pyrenaica*, or *P. Ponderosa*,—which, while thoroughly hardy, possess the additional recommendation of yielding timber, at all ages of thinning, of a greatly superior quality to that of the *P. Pinaster*, especially the first-named—

and to reserve the Pinaster only for use in such sandy stretches on shoreland situations, as will carry no other variety, but where the individual qualifications of this pine render it a most valuable acquisition for such positions.

ON IMPROVEMENTS ON THE ESTATE OF HALLHEAD, ABERDEENSHIRE.

By Hary Shaw, Bogfern, Tarland.

[*Premium—The Minor Gold Medal.*]

The estate of Hallhead is the property of Henry Wolrige Gordon, Esq. of Esslemont and Hallhead, in the parish of Leochel-Cushnie, and county of Aberdeen, situated on the rising ground between the rivers Dee and Don, about 7 miles from each, from 27 to 30 miles inland from Aberdeen. The arable land on the estate is from 900 to 1200 feet above the level of the sea. The plantations are from 1200 to 2000 feet above sea-level. In giving a brief statement of the improvements on the estate, the writer will not attempt to contrast it with what it was in his grandfather's or great-grandfather's days, but what it was and what it is in his own recollection and observation. About the year 1820 agriculture was in a very backward, rude condition; the land was ploughed with 12 oxen to the plough,—such ploughing as it got. There were no carts on the estate before that time; the making of a new plough cost one shilling, the farmer supplying the wood, the coulter, and the sock. Before the introduction of carts on the estate, the dung was taken to the fields on horses' backs, with curruks and packets. The crops were taken to the stackyard in the same manner; the oats were carried to the meal mill on the horses' backs, and the meal mill and kiln at that time were of very ancient construction. The distillation of smuggled whisky was a very common practice, and the tenants devoted the most of their time and attention to the brewing of whisky in place of attending to the improvement of their farms. About the year 1824 new ploughs and carts were introduced into the estate from Aberdeen, and a spirit of improvement began. There were no threshing-mills on the estate until 1832, and at present there are 13. Between 1832 and 1840 the taking in of waste land commenced, and lime was driven from Aberdeen and applied at the rate of from 16 to 20 bolls to the imperial acre, which was found to raise very profitable crops of all kinds of cereals, turnips, and grass where the land was dry; but the tenants found, by experience, that lime was of no use to land that was wet. The tenants then petitioned the late factor, Andrew Ross, Esq., banker, Tarland, to apply for a grant of the

Government Drainage Money, which he was fortunate enough to receive, and he obtained a second grant when the first one was expended. Mr Beattie, the Government Inspector, took great interest in instructing the tenants and the contractors to abide by the government rules in cutting and building to the dimensions required. The greater part of the drains were opened by contract, but the building and filling was done by special hands at day's wages, and up to the present day very few of them have required any repairs. The leaders were all 4 feet deep, the others 3½ feet deep, with broken metal on the top of the built eyes. A very successful experiment was performed by the late factor, on the Mains of Hallhead, on a marshy bog of 20 acres, almost level, and dangerous for cattle and horses going into it to pasture. The factor ordered all the drains to be cut 5 feet deep, 20 inches wide at bottom; in the centre of this 20 inches another foot deep of the moss was taken out by a peat spade made for the purpose, and then 3-inch pipes with collars laid in the bottom. With boards or green turf an opening of 9 inches was left above the pipes. This moss is now as dry a field as any on the estate, but is very much sunk; there is not at present 4 feet between the surface and the collars and pipes. This is one of the exceptional fields on the estate which have been drained with pipes and collars; the rest were all mostly done with stones, as they are very abundant on the estate. All the tenants took advantage of this Government Drainage Money, some less some more, according to the requirements of their land. Some of the tenants drained their land where it was not naturally wet, for the purpose of breaking the pan. What we call pan is a stratum on the top of the subsoil, below the plough furrow, through which the rain water cannot get, but after the land is drained, the pan naturally decays, or loses its original hardness, and then the rain water passes through, and the plough gets freely into the subsoil. The government drainage on the estate has been one of the greatest advantages the tenants ever received. It makes all kinds of manure profitable to the crops, it brings the crops earlier to maturity, it makes the land to be always in proper working order, and a crop is expected whether the season be wet or dry. The fields are now inclosed principally with stone dykes, and the land is all farmed on the six course shift—that is, three years in grass in succession, then oats after lea, then turnips, then oats with grass. At the present day there is much demand through Scotland for farm servants' cottages, but there is nothing of that required on this estate; the late factor gave every industrious working man that applied to him a stance for a house, with from 2 to 10 acres of barren land to improve for a croft to keep a cow for his family, without any rent for a number of years. There are now about

twelve of these new crofts on the estate, and the crofters and their families are very well supplied with work from the rest of the tenants. The following table will show the number of acres to each croft of new land, and the number of acres of new land distinguished from the old land, belonging to all the tenants on the estate since the agricultural improvements commenced:—

Possessions.	Old Land.	New Land.	Barren.	Moss.	Total.
	A. R. P.	A. R. P.	A. R. P.	A. R. P.	A. R. P.
Blueardens, .	26 0 7	18 2 0	1 0 10	...	45 2 17
Blackhills, .	30 3 0	27 2 28	13 3 20	...	72 1 8
Oldtown, . .	27 3 13	17 1 24	12 3 14	...	58 0 11
Holmhead, .	30 1 26	16 1 24	...	...	46 3 10
Braehead, . .	15 0 38	1 1 0	...	...	16 1 38
Dunsdykes, .	25 1 0	32 2 16	...	...	57 3 16
Bogfern, . .	53 1 18	80 0 4	...	...	133 1 22
Graystone, .	5 0 13	31 0 7	...	...	36 0 20
Reekie, . .	24 2 0	27 0 38	...	...	51 2 38
Walkend, . .	42 3 9	52 3 25	...	2 0 12	97 3 6
Mains of Hallhead,	42 3 30	48 3 11	...	1 1 6	93 0 7
Bogfield, . .	21 0 0	12 3 15	5 0 36	0 2 21	39 2 32
Confunderland, .	68 2 18	74 1 12	12 2 18	5 1 20	160 3 28
Burnside, . .	...	6 0 3	...	...	6 0 3
Swellhead, .	...	6 2 17	...	...	6 2 17
Swellend, . .	...	6 1 4	...	...	6 1 4
S. Bagfield, .	...	5 2 9	...	...	5 2 9
Midfield, . .	...	2 1 8	...	...	2 1 8
Windsyee, .	...	0 2 12	0 3 12	...	1 1 24
North Confund,.	...	6 2 23	...	...	6 2 23
S. Confunderland,	...	10 3 6	...	...	10 3 6
W. Badythrooker,	...	13 2 20	3 0 16	...	16 2 36
E. Badythrooker,	...	6 3 24	0 2 17	...	7 2 1
West Burnside, .	2 2 26	46 1 14	16 2 20	...	65 2 20
N. Badythrooker,		4 1 6	6 0 18	...	10 1 24
	416 1 38	556 3 30	72 3 21	9 1 19	1055 2 28

The young plantations have been principally conducted under the charge of the present factor, and commenced as follows:—

	Acres.	Roods.	Poles.
Planted in 1869, . . .	36	0	36
„ 1870, . . .	50	3	25
„ 1871, . . .	163	1	5
„ 1872, . . .	136	3	36
Total, .	387	1	22

The kind and number of the plants were as follows:—

Scotch fir, ...	1,158,000
Larch, ...	203,000
Spruce, ...	52,000
Birch, ...	20,000
Total, .	1,433,000

Messrs Cardno & Darling, in Aberdeen, were the seedsmen who supplied the plants, and we have every reason to believe that they were very fresh and wholesome. Part of them were seedlings and part were transplanted. The difference between the seedlings and the transplanted was not great at the time of planting. The portions planted in November and December came very fast forward the succeeding summer; but those planted in March and April made scarcely any progress the first summer, and some of them died away altogether. But the seedsmen have made up all the blemish. There are two belts low down on the estate, principally for shelter; the one contains about 24, the other about 8 acres. The acreage of these two belts are included in the 387 acres. The cost of the plants and planting was L.707, which would make the expense per imperial acre to be about 21s.; but the cost of dykes, fencing the plantations where required, are not included. There were small portions between the hill and the arable land belonging to the tenants which did not require much fencing, and a portion at the top of the hill, neighbouring Lord Aberdeen's property, and the estate of Cushnie, was not fenced. There were some portions of the plantations, where it came in contact with fields for grazing cattle, where the fence required to be double, stone dykes were built at 6d. per running yard, the tenants driving in the stones, and the proprietor building the dykes. Some old dykes required repairs, which were done at small expense. The hill was all inclosed with feal sunk fences, varying from 2¼d. to 3¾d. per yard; some parts being rocks, others very soft; all four feet high. The following statement is as near the cost as can be ascertained by the writer:—

7,026 yards feal sunk fence, at 3d.,	L.87	16	6
790 yards dykes repaired, at 1d.,	3	5	10
2,580 double stone dykes, at 6d.,	64	10	0
	L.155	12	4
Cost of plants and planting, .	707	0	0
	L.862	12	4

The writer had all the contracts to let and the dykes to measure. The expense of the fencing was larger in consequence of a drove road passing through the hill, which required to be fenced on both sides, and which was used by the Highland sheep going from the Dee-side hills in autumn to their winter pasture in the low lands of Banff and Aberdeenshires, and returning again in spring, and occasionally through the whole year. There are two large belts lower down, separate from the hill, intended principally for shelter, which required to be inclosed, mostly with double stone dykes, which made the expense of fencing

greater than on the hill plantations. There are still some belts intended to be planted near the old mansion house of Hallhead. The plantations, on the whole, are doing remarkably well. Some of the larches that were planted the first year are from five to six feet high, and in a short time will be a very great shelter, being on the west and north-west part of the estate.

The buildings on the property are now very much improved in comparison to what they were forty years ago. At that time they were very much in the old style; many of them were stone and mortar walls, thatched with divot and rushes alternately; but now the walls are generally built with stone and lime, and a good number of the houses are slated. A good square court of offices has been built by the proprietor on the farm of Confunderland, the tenant paying very moderate interest. The square contains an improved thrashing-mill, driven by water, in place of the old one driven by horses; the byres are of the double construction, with a pass from end to end in the centre. The ancient mansion house of Hallhead got a thorough repair last summer, and is now inhabited. It was originally built in 1616.

The plantations, buildings, and road-making have been all conducted under the superintendence of the present factor, Harry Ross, Esq., banker, Tarland, and the tenants on the estate have lived very comfortably under just and independent management, with a liberal landlord, whose motto has been, *Live and let live.*

ON THE SOILS AND SUBSOILS SUITED FOR PLANTING.

By John Nisbet, Assistant Conservator of Forests, British Burma.

[*Premium—The Medium Gold Medal.*]

Having undergone a course of forest training in Germany, this report is, of necessity, German in its views, which, doubtless, must seem strange to the Scotch forester. Compare, for instance, what is here affirmed concerning the beech, viz., "the beech, on whatever formation it may occur, demands for its proper development a strong mineral soil, fresh and rich in humus, or vegetable mould," with the statement in Grigor's "Arboriculture," page 69, "a dry, poor, gravelly, or chalky formation, will suit best for the beech, the birch, and the pines." Those two statements, though at variance, may both be correct. In Germany, the pines would first be cultivated for one term of rotation (*P. austriaca*), afterwards the soil having been enriched by the decomposition of the exuviæ, the spruce fir (*Picea excelsa*), and later on the beech, might be cultivated. In weighing t aoveg

statements it must be borne in mind that, under the influence of sea-air, the beech may in Scotland thrive better on a poor soil than in the inland parts of Germany. This also accounts for the fact that, although a tree grows less luxuriantly the nearer it approaches the northern limit of the zone to which it belongs, the beech is found well grown in and around the duchy of Lauenburg, and in the south of Sweden and Norway, the boundary of its zone being a line from Odessa, by way of Kœnigsberg, to Bergen in Sweden. Again, in Germany the ash does not thrive well near the sea, while the reverse may be the case in Scotland.

A year's training under a German oberförster, and a course of study at a forest school, together with numerous tours of inspection with officials in various parts of Germany, are the sources of information contained in this report. Begun in leisure, it has been curtailed from want of time, and the Coniferæ are not included. It has been taken for granted that the most violent storms in winter come from the west. This is a mere assumption, seeing that the direction of the wind is always to some extent modified by the direction of the valleys and mountain chains in the surrounding district.

Introductory Remarks concerning Soils and their Relations to the Growth of Timber.

Before considering the marked differences of growth exhibited by the several forest trees, according as they occur in various kinds of soil, it might have been expedient to state briefly the chemical constituents of the principal minerals which occur in the rocks, whose decomposition yields the soils on which these trees grow. As that, however, belongs to agricultural chemistry, we refrain from entering on that subject.

The growth of any particular tree depends on the nature of the soil A, and of the situation, B, on which it occurs.

A. As regards the soil, we must take into account,—

1. Chemical composition.
2. Amount of moisture.
3. Degree of looseness.
4. Depth of soil.
5. The quantity of humus.
6. Nature of the subsoil.

1. *The Chemical Composition of the Soil* affects the growth of trees indirectly by means of its physical properties (*e.g.*, the amount of moisture contained, and the degree of looseness or porosity), and also directly by the mineral matter taken up by the rootlets, and deposited in the wood and leaves in their annual growth. This mineral matter, which remains as ashes on wood being *completely* burned or decomposed, forms a small per-centage of the cubic contents of any tree, and, according to some (Dr G.

Heyer, director of the Forest Academy, Münden), is found in sufficient quantity in almost all varieties of soil. In addition, rain, snow, dew, and hail are continually bringing fresh supplies.

2. *The Amount of Moisture contained in the Soil* is of the utmost importance for the supply of the rootlets of trees with the vast quantity of water given forth through the leaves during the annual period of vegetation. In order to satisfy this demand, the soil must be capable of absorbing moisture, and of retaining it. Loose sand, with a small percentage of clay, absorbs moisture quickly, but has not the power of retaining it; on the other hand, binding clay does not absorb moisture rapidly, or to a great extent, but is exceedingly retentive. The admixture of vegetable mould with the soil has the effect of modifying both extremes.

There are five degrees of moisture in soils:—

(1.) *Wet.*—On lifting up a handful, water drops to the ground.

(2.) *Moist.*—On squeezing a handful, water drops to the ground.

(2.) *Fresh.*—On squeezing a handful, traces of moisture remain on the hand.

(4.) *Dry.*—On squeezing a handful, no traces of moisture remain on the hand.

(5.) *Arid.*—On being merely rubbed, it flies off as dust.

3. *The Degrees of Looseness.*—The more clay contained in a soil, the more binding it is; and according as sand or lime is added to, or occurs in its composition, the degree of looseness becomes heightened. For the growth of timber binding clay is unfavourable, as it does not allow free entrance to moisture and air. On the other hand, very loose soils, especially if wanting in depth, are apt to become dry, and are exposed to the influence of frosts; while the trees, having no firm support in the shallow, unretentive soils, often fall before the fury of wintry storms. Here, again, both extremes are modified by the admixture of humus.

4. *Depth of the Soil* favours the growth of all trees, since

a. More moisture is absorbed, and is retained for a longer period of time, and

b. The roots have more extensively developed, the annual supply of sap is greater, and the cubic contents of the tree are greater than on shallow soil.

The classification of soils according to depth may be,—

(1.) *Very shallow*—up to 6 inches in depth.
(2.) *Shallow*—from 6 inches to 1 foot.
(3.) *Middle Deep*—from 1 foot to 2 feet.
(4.) *Deep*—from 2 to 4 feet.
(5.) *Very deep*—over 4 feet.

Mild loamy soil, in which sand and lime are present in a higher degree than clay, deep, fresh, and rich in vegetable mould, is favourable to the growth of many forest trees, such as oak. Lime is best suited for beech (*Fagus sylvatica*), Ash (*Fraxinus excelsior*), Maples (*Acer*), Elms (*Ulmus*), black or Austrian Pine (*Pinus austriaca*), Dwarf Pine (*Pinus pumilio, seu Mughus*), and Yew (*Taxus baccata*). As already remarked, a *binding* clay, without a sufficient percentage of humus, is not suitable for any forest trees. In the heat of summer it contracts, bursts asunder, and injures the rootlets. A soil composed of quartz sand, with a small percentage of clay, fresh and rich in humus, is capable of nourishing sufficiently any tree occurring in our island, if it is not too shallow. Soils that are rich (minerally), although they yield trees of superior height and greater cubic content, if they are very moist, produce timber of inferior quality and less durability.

Dry and arid soils, if properly treated, are, as a rule, capable of nourishing the Scotch fir (*Pinus sylvestris*), along with which the birch—a soft wood—(*Betula verrucosa*), might be grown if advisable. For example, in the North German plain, where the pine forests are cut through by railways, safety belts are planted with birches to prevent sparks from the engine funnel reaching the tinder-like leaves that cover the soil.

5. *The quantity of Humus contained in a Soil* plays an important part in regard to the growth of trees, for by the decomposition of the leaves, carbon and various chemical compounds forming the ashes are returned to the soil. Carbonic acid, formed by the decomposition of humus, affords indispensable nourishment to trees, and decomposes such minerals as occur, so that they become soluble in water, and are absorbed by the rootlets in the form of alkalies. Humus also absorbs from the atmosphere ammonia (NH_3), oxygen, moisture, &c., all substances necessary for the nourishment of plants. It possesses in a high degree the power of absorbing and retaining moisture, and as it is only moderately binding, it renders more loose and porous a binding, clayey soil, and binds a loose sandy one.

6. *The Nature of the Subsoil* affects the quantity and quality of the timber produced, seeing that it materially affects the quantity of moisture contained in any soil. It may be impervious or cleft, in horizontal, inclined, or tilted layers. Subsoils of plastic clay, of moorpan (Ortstein and Raseneisenstein of the North German plain), or of quartz conglomerate, are the most unfavourable; far more suitable are loams, marls, or peats (when the latter is not too wet), and such rocks as are moderately cleft, by reason of which the upper soil can only be moderately moist.

(*b*) *Concerning the Situation of the Soil.*—We must consider

I. Height above the level of the sea.

II. Aspect or inclination of the hillside towards one of the points of the compass.

III. Angle of inclination of the hillside towards the horizontal.

1. *Height above the Level of the Sea.*—Trees arrive at the limit of their growth much sooner in a vertical than in a horizontal direction towards the Poles (according to Hundeshagen in the ratio of 1 to 450 for every 1° Fahrenheit). Trees growing on suitable soils at the sea-level produce the greatest quantity of timber and the most seed, but the quality is not so good, owing to the rapidity of growth. Among important forest trees, the following may be accepted as average heights in Germany.

1200 feet to 1300 feet—Hornbeam (*Carpinus betulus*) and Scotch fir, which latter, in unmixed forests, is met with at a much greater elevation, but being comparatively inelastic, it frequently suffers from snow-break.

1600 feet to 1700 feet—Birch, elm, and, in favourable circumstances, the oak.

2200 feet to 2400 feet—Beech, maple, ash, birch (*Betula pubescens*).

3000 feet, and often higher—Silver fir (*Abies pectinata*).

Spruce fir (*Picea excelsa*) and larch (*Larix europæa*)—The heights to which these trees ascend the mountain slopes are modified by the following circumstances.

2. *Inclination of the hillside towards one of the points of the compass.*—The greatest quantity of timber is produced on gently sloping eastern, north-eastern, and northern hillsides, which are most cool and moist. The more southern aspects, however, produce the most durable timber; but young plantations or natural undergrowth are exposed to the burning rays of the summer sun, and partly to dangerous late frosts. The N.E., E., and S.E. aspects are most exposed to late frosts. The W. aspect, when exposed, produces the least quantity of timber, for it is from the W. that violent winter storms in general come.

3. *The Angle of Inclination of the hillsides towards the horizontal* also exercises a most powerful influence on the growth of trees, for the greater the angle of inclination, the more marked are the differences in the quantity of the timber produced. An inclined plane should, *cæteris paribus*, yield more timber than a horizontal plane.

(*a*) Because it is greater in the ratio of the secant to the radius, and the trees do not stand quite perpendicular to the horizontal; and,

(*b*) Because each tree receives more light in consequence of the gradual slope.

In reality, however, this is not the case, for on the hillsides the soil is usually wanting in depth, and also in moisture. After heavy rains some of the soil is always carried down into the fertile valleys, thus enriched from the surrounding hills. Accord-

ing to the angle of inclination, one might describe a hill as gently sloping up to 10°; moderately steep, 10° to 20°; steep, 21° to 30°; very steep, upwards of 30°.

In addition to these three chief features, the local climate and the growth of trees is influenced more or less by the character of the surrounding district, and by the form, extent, and direction of the ranges of hills on which the forests are.

THE VARIOUS SOILS SUITED FOR THE DIFFERENT HARDWOOD FOREST TREES.

The beech (*Fagus sylvatica*) deserves the first place as the only hardwood that is by nature admirably suited for growth in unmixed forests. By the annual fall of its leaves, rich in potash and easy of decomposition, it forms an excellent humus, and enriches the soil. In high timber forests it finds its proper place, showing the best growth where the foliage builds an almost unbroken roof, for then the rays of the sun cannot break through and draw up the moisture contained in the soils. The period of rotation of crops (*turnus*) is usually from 100 to 120 years, being longer on good than on poor soils. For coppice it is not so suitable, as the power of regeneration from the stool is not great, and also the growth of the shoots is not rapid; but it is met with in this form on a soil such as lime, that tends to increase its power of springing from the stock.

It occurs as coppice under standards, where the latter throw much shade on the underwood, or where they, as in the case of oak standards, require the ground to be well guarded against the rays of the sun. On lime, and the milder clayey varieties of the "Rothtodtliegendes," it thrives well as standards, and the increase of growth is very marked; but then it overshadows the coppice more than any other tree, and the timber of the beech at no time commands the high price usually fetched by other hardwoods. With these remarks, we proceed to consider it in high timber forests.

The beech, on whatever formation it occurs, requires for its proper development a strong, mineral soil, fresh, and rich in humus or vegetable mould. On plains it is often found in company with the oak, on sandy-loamy deposits, if these are not too dry or too moist. On the hills of the various sandstone formations, particularly of the bunter sandstein (Solling Hills in Hanover, Rheinhardt's Wald in Hessen-Cassel, and Spessart Range) and Keuper, it occurs on the clayey-loamy, dark-red varieties, thriving best in the cooler and fresher situations, and where the soil contains much humus. But on the poorer, light-coloured sand, and in drier situations, or those exposed to storms, its growth is slower, the soil becomes impoverished, and one of the conifers would be more suitable.

Favourable to the growth of the beech are soils formed by the decomposition of the clay-slates of the Laurentian system, yielding a strong mineral clay, of the more earthy varieties of the Cambrian, Silurian (*e.g.*, the beeches covering the slopes of the spurs of the Harz Range, and the lower hills of the range itself, as around Lauterberg or Ilfeld), and Permian systems (Eisenacher Forst). Granite, gneiss, and porphyry chiefly occur in situations beyond the limit of the beech; when this is not the case, it thrives well on granite and gneiss, if rich in felspar, hornblende, and humus (but not on the compact varieties, containing much quartz and wanting depth), and on the soft, dark-coloured clayey augite-porphyry. The true home of the beech is on lime, basalt, and diabas, although even here on stony soils having no great depth, as on steep hillsides, its culture is not attended with satisfactory results.

Sandy Soils.—We refer rather to the sand formations of the Mesozoic period (*e.g.* bunter sandstein) than to the fertile loamy sands of the more recent formations. On the whole, the beech is not well adapted for forming *unmixed forests* on sandy soils, and in company with it are often found the oak, hornbeam, and soft woods, such as birch and aspen (*Populus tremula*). Only on the clayey-loamy varieties, admixed with vegetable mould, and with cool, moist N.E. or N. exposure, does it show a quick growth in pure forests, though ash, elm, maple, and sycamore are frequently intermixed, that these latter may produce valuable timber. On such soils the intervals between two seed-years is generally long. The fellings before the *reproduction by natural means*, made for the purpose of preparing the ground for receiving the seed, must be carried out *gradually and cautiously*, for—

1. Owing to the general want of mineral strength of sandy soil, the leaves are not easily decomposed, and therefore atmospheric agents must be allowed to act more freely on them; and

2. Sand favours the growth of bad grasses, of whortle-berries (*Vaccinium Myrtillus*), and of heather (*Calluna vulgaris*)—all of them obstacles to the reproduction.

One must begin the fellings fifteen to twenty years before the natural reproduction takes place, and until germination of the seed the parent trees must cast a deep shadow equally over the ground.

With regard to the clearances, various circumstances are to be considered. Is the sand loamy, comparatively strong in mineral substance, and rich in humus, and at the same time in a fresh, favourable situation, then *gradual clearance*, extending over twelve to fifteen years, is to be recommended, if not rendered absolutely necessary; for here in their youth the beeches require the protection of the mother trees against frost and grass; and, in addition, experience has shown that under

such circumstances they bear the shade well. But if the sand be poor and dry, the clearances must follow sooner; where the undergrowth thrives worst, the old timber trees must be most speedily removed, and where it shows the quickest growth, the latter should be spared for some years in order to throw a light, beneficial shade around them. (Ex. Forste des Sollings, Oberförsterei Marksuhl near Eisenach.)

Clayey soils, as regards the rate of decomposition of fallen leaves and vegetable matter, form the medium between lime and sand; it is not effected so rapidly as on lime, yet more quickly and thoroughly than on sand. Many differences are observed, according to the kind of rock whence the soil (clayey) has arisen, which must be examined ere we can learn whether the growth of the beech is favoured.

1. As already remarked, *granite*, *gneiss*, and *mica slate* are generally found in situations where the thriving of beech is scarcely to be looked for; but, when occurring in more favourable localities, they yield cool, clayey soils, less active in decomposing the fallen leaves, so that an imperfectly decomposed humus covers the ground. This, on a natural reproduction taking place, prevents the seeds from germinating and taking root; grass and whortle-berry often gain a footing, and great difficulty may be experienced in reproducing the forest, if indeed one be not forced to call in the aid of a conifer for a term. Of these rocks, granite in this respect may be considered the worst, as on gneiss, milder as to its mineral composition, the reproduction is more easily effected. The poorer, loose soil of the mica-slate, usually wanting in depth, is not well suited for the beech.

2. *Basalt, diabas* (*greenstone*), *melaphyr*, *phonolith*, *and the varieties of augite-porphyry*,—all rocks rich in hornblende and augite,—when earthy, and not too stony, are characterised by great mineral strength, and the property of retaining the atmospheric moisture. Here the term, period of rotation, or *turnus*, is much higher, although in their first years the young plants do not grow so rapidly.

Basalt and diabas yield a *limey clay soil*, as suitable for the beech as lime, with which they have much in common. The fallen leaves are rapidly converted into humus, so that the soil is soon suitable for receiving the seed, and it may be kept thus for a period of years without being reduced in mineral strength like sand, nor liable to become barren, or overrun with weeds and grass, as is the case with lime. On such soils natural reproduction is, as a rule, easy and safe, and the undergrowth can endure a good deal of shade from the parent trees, so that clearances may be made sooner or later, as the demand for timber exists, without incurring the dangers which threaten

either sand or lime. (Ex. of beech high forest on such soil,—Bromberg bei Adelebsen am Solling.)

3. The beech also grows well on soils formed by the *mild clay-slates of the Laurentian system*, and by the *earthy varieties of the Cambrian, Silurian, and Devonian systems*, where such lie in favourable situations. They also, like the basalts and diabas, decompose the leaves quickly and thoroughly, are easily prepared for receiving the seed, and, where prudence has been shown in the preparatory fellings, remain for many years (especially the clay-slates) without being impoverished or overrun with grass and weeds. Few obstacles prevent natural reproduction, and after germination the young plants develop themselves rapidly, and suffer little from the effects of the sun. But at the same time they can bear shade for a long time, so that the subsequent clearances may with comparative impunity take place a few years sooner or later, as convenient for the proprietor. (Ex. of beech forests on such soils are in the Oberförsterei Lauterberg am Harz.)

The Rothtodtliegendes (*Magnesian Limestone*) *of the Permian system*, occurring in great quantities throughout the Thüringer Wald, and over which stands the greater portion of the *Lehrforste der Eisenacher Forstlehranstalt*, may be said to yield soils of two kinds:—

a. The better, fresh, earthy varieties in favourable situations, which rank equal with the better clay soils of the Cambrian, Silurian, and Devonian systems; and

b. The poorer, less earthy varieties (quartz-conglomerate), which, along with those under *a*, but in less favourable situations, may be best compared to the bunter-sandstein, for, like it, the vegetable mould is not so rapidly formed, although, as regards mineral strength and freshness, it must be classed much higher than the latter.

Marly Soils.—The marly soils of the Keuper formation produce high timber forests of excellent growth. Here the beech finds a mild, fresh, deep, loamy-marly soil, on which natural reproduction has few difficulties to struggle against. In all fellings, both before and after the natural reproduction, caution must be exercised, for if much exposed to the sun the ground becomes dry and overrun with grass and weeds.

Limey Soils.—The true home of the beech is, however, on the better clayey and loamy soils of our lime formations, especially of the *muschelkalk* (Triassic system, unfortunately not to be found in Britain), and of *dolomite or mountain limestone*, together with the limey clays of the basalts, which break through the younger rock-formations. This partiality for lime is shown by the smoothness of the bark, the straightness of the trunks, and their freedom from branches; by the fact that the greatest annual

increase of growth takes place there, and also that the reproduction by natural means in most cases yields favourable results.

In fresh, sheltered situations on lime the beech bears seed early (commencing about the seventieth or ninetieth year), and continues to do so at short intervals (three to five years), and in abundance. Here also the fallen leaves soon become decomposed, and converted into humus, so that fellings preparatory to a natural reproduction must not be begun until four to five years before a seed-year is expected, and even then the surface of the soil must be kept in the shade. Should this not be done, the soil soon becomes dry, and is overgrown with weeds, or gets barren; the improvement of such a soil, especially if on a steep hillside, is one of the most difficult tasks that can be assigned to the forester. Under the deep shade of the mother trees, the seeds germinate abundantly, grow slowly, and bear the shade of the old trees well. As the young plants are liable to suffer from solar heat, the clearances must take place later than on clayey soils. In mixed beech forests, where ash, maple, and elm occur, the clearances must be made sooner, otherwise the latter succumb to the shade.

Here, however, the clearance can be made either gradually, or, if necessary, when the plants are 3 to 4 feet high, in one winter; for on lime the young beeches do not suffer so much from late frosts as on sand.

Poor, Shallow, Stony Soil.—The growth of the beech becomes less favourable as the soil gets shallower, wanting in earthy ingredients, and stoney (especially if the stones be quartz). Under such circumstances, the stems are short, develop more branches, bear fewer leaves, and have a shorter life; the soil becomes more or less impoverished, and the difficulties of natural reproduction are increased. Should this take place, many plants die from the first summer's heat, and each successive summer injures those remaining. Preparatory fellings must not be made at all, or most cautiously; only such trees as are overgrown by their neighbours should fall to the axe. The clearances must be made soon after the reproduction, for the purpose of strengthening the young undergrowth, even at the risk of the ground becoming overgrown with grass and other weeds.

In such situations, the cultivation of the beech should not be tried; it is more profitable to plant the spruce fir (*Picea excelsa*), because of its shallow rooting, and its contentment with poorer soil.

The Oak (*Quercus sessiliflora and Q. pedunculata*).—A century or two ago the oak played a much more important part among the forest trees than it now does. On the fertile plains, where it once grew to gigantic dimensions on the deep diluvial and alluvial soils, the extensive oak forests have gradually been

felled in order to make way for the cultivation of cereals and other agricultural produce, while sufficient energy has not been displayed in its reproduction. Thus the noblest of our forest trees is now chiefly found in hilly districts. On account of the diminishing supply, and rising demand for oak timber, much has been done of late, both at home and abroad, for its cultivation.

Young trees shelter the soil from the sun, but as they advance they demand more light and room, so that many die if not timeously thinned by the axe. Among hardwoods, the oak, ash, maple, sycamore, and elm, and among conifers, the Scotch fir, Austrian pine, Weymouth pine, and larch are of this order. Such trees, excepting the pines, are not so well suited for unmixed timber forests, and are best developed singly or in groups in high timber forests of other trees. In such forests the oak assumes greater dimensions than when growing only with other oaks, for it may be laid down as a rule that *it thrives best with the crown free, the stem sheltered and in shade, and the foot under covering* (German—Freie krone, seitenshütz, bodendecke).

We shall now point out the differences of the two varieties of oak in regard to the situations in which they shew the most favourable growth, and most frequently occur.

Quercus pedunculata is disposed to develop many branches, but where this is not possible (as in forests of beech with oak), the stem is straight, often free from branches to the height of 70 or 80 feet, its whole length reaching 100 to 130 feet. The tap-root goes to a depth of 5 to 6 feet in good soil, so that the subsoil is of great importance in its growth, and for the quality of the timber. Moderately cleft, tilted (but not horizontal) varieties of limestone, of the milder clay slates, and of the richer sandstones and marls, of granite, basalt, and diabas, and clayey porphyry, and of good peat—all of which generally continue fresh, and are not apt to collect an over supply of water,—are by far the most favourable subsoils for both kinds of oak.

The timber is of fine texture, tough, hard, and heavy. *Q. pedunculata* yields the strongest and most durable timber grown in large quantities in our climate, and is indispensable in ship-building, in the construction of mills, and of structures in or near water (*e.g.*, the chain pier at Trinity). Under water it is imperishable, becoming at last petrified.

Q. sessiliflora is in many respects similar to *Q. pedunculata*. It does not grow so quickly, but has a longer life. It is more disposed to form branches, but may, under favourable circumstances, attain equal proportions. The roots do not penetrate so deep into the soil. The timber is less tough and elastic, but more easily cleft, hence more prized by coopers. The texture being coarser, it is not so well suited for carving and the manufacture of cabinets. It is heavier, and yields better firewood (in

the proportion of 12 to 11). For all building purposes the timber is little inferior to that of *Q. pedunculata*. The latter prefers the valleys and outlying hills of mountain ranges, while the former is at home on the mountains themselves. They often occur in company, but *Q. sessiliflora* ascends the slopes to a greater height, although it does not grow so far north. *Q. pedunculata* grows best in warm, sunny valleys, plains, and hilly land; in mountainous districts it grows best on south and west slopes. *Q. sessiliflora* prospers in hilly, mountainous districts in every aspect, but at a great elevation it also seems to prefer the south and west slopes.

As already remarked, the oak is not by nature intended to form extensive unmixed timber forests, but requires the aid of a shade-enduring and soil-improving tree; for the growth of oak depends less on the kind of soil than on its quality, depth, and freshness. No tree is better qualified to perform these functions than the beech.

In coppice wood with standards—for which the term *composition forests* may be used, as such forests consist partly of large stems and partly of coppice. The expressive German words are *hochwald*, high timber forest; *mittelwald*, composition forest; and *niederwald*, coppice wood. The oak finds a suitable place, as it enjoys the sunlight, and does not throw much shade on the coppice below. Here it soon acquires moderate thickness, but at the expense of its length and freedom from branches. The oak becomes fully developed at two hundred to two hundred and forty years if growing in high timber forest, but standards exposed to the sun may be felled sooner. In order to obtain valuable timber, in such cases, the trees must, ere they grow too old, be stripped of their lower branches as far as practicable.

The oak reproduces itself from the stool, and hence is suitable for coppice. Coppice woods of oak yield a good income, for the young bark is sought after by tanners. Such woods have generally a term (*turnus*) of sixteen years, and produce bark of better quality than that obtained from older trees before the time of felling (a custom still practised around Hildesheim). This bark is most prized when grown on strong mineral soil on hillsides in sunny situations (south side), where the oaks have not been too closely planted, but have had room for development. It also possesses a higher value if gathered before the age when the bark begins to split. In higher situations *Q. sessiliflora* is said to yield bark in greater quantity and of better quality than *Q. pedunculata*.

We have remarked that the thriving of the oak depends less on the kind of soil than on its quality, the amount of humus, and, above all, the amount of moisture contained in it. The best growth occurs in a deep, somewhat loose, loamy sand, or

sandy loam; but it also thrives well on loam, on sand (if moist), as in the Mark Brandenbur n Prussia, and on the dark variety of bunter sandstein, which a ears more suited for the oak than the younger sandstone form ons, although these, if sufficiently moist, are capable of rearing fine oak forests. Although the oak prefers a moist, and even thrives on a wet, soil, it will not grow on marshes until they have been drained, and then it not unfrequently grows well.

In hilly districts, the soils arising from the decomposition of most of the formations of the Aozoic and Palæozoic periods, *when not wanting in depth*, favour the growth of the oak. Of these the clayey granite, gneiss, and mica-schist, and the various sandy formations of the Cambrian, Silurian, and Devonian systems yield the best soil.

Clayey porphyry yields a moist, earthy, comparatively fertile soil, suitable for the oak, not so binding as most clays, which on that account do not favour the oak. Diorite, less speedy of decomposition, and poorer in earthy matter, gives rise to a soil too shallow for the oak. The fresh, strong, clayey soil (containing also a slight percentage of lime), arising from the decomposition of diabas, appears too binding for the oak, which here does not remain long healthy.

The same remark applies to the fertile, strong, fresh, clayey soils yielded by melaphyr (*e.g.*, Ilfeld am Harz) and basalt (*e.g.*, Bromberg am Solling); they appear too binding for the oak, and are frequently shallow.

The clay slates of the Laurentian and Cambrian systems may form soils of two kinds:—

1. The softer, blueish varieties decompose easily to a mild clay, comparatively free from stones, but in general not very deep.

2. The quartzy, greenish-grey varieties decompose slowly, and give rise to a loose, stony, and shallow soil; both are more suited for the Norway spruce than for the deep-rooted oak.

In the Silurian and Devonian systems we may again notice soils of two kinds:—

1. The dry, shallow, loose, stony varieties, sometimes loamy, but frequently poor in earthy substance, which are derived from the slowly decomposing slates, are unsuited for the oak ; and

2. The sandy or loamy, fresh, fertile kinds yielded by the sandstones and the conglomerates containing more earthy matter. These, when not wanting in depth, afford an admirable soil for the oak, which here produces excellent timber.

The Permian system may also be viewed as mainly giving rise to two entirely different varieties of soil—

1. *The Conglomerate* consisting of quartz, feldspath, granite, syenite, gneiss, mica-schist, and porphyry, all held in mechanical union by a brownish-red kind of clay, which on decomposition

yield in general a shallow, often dry, poor clay soil, with little earthy substance. On such a soil, the cultivation of oak timber is not to be thought of.

2. The *Clayey Sandstones and Slaty Clays* form a friable clayey soil, which, especially when having a N. aspect, is characterised by strength, freshness, and a fair percentage of vegetable mould. Although not the most favourable situation for the oak, it is found here and there in the beech (Eisenacher Forst) and silver fir forests with a lively growth; but in general the soil seems rather binding and varying in depth. Q. *sessiliflora* is more frequently met with than Q. *pedunculata*, at least in the Eisenacher forests.

To enumerate the various soils of the younger systems, and examine how far they favour the cultivation of the oak would be tedious; we shall treat them under the heads sandy, limy, clayey and marly soils.

The deep, fresh, mild, fertile loams of the post-Tertiary period are suited for the growth of *all* our trees, but we seldom find forests on them, as tillage ensures a higher revenue to the proprietor.

Sandy Soils.—Among the varieties of sand we consider :—

1. *Bunter Sandstein.*—According to the nature of the cement and the proportion to the number of grains of quartz contained, the bunter sandstein (Triassic system) yields soils of different qualities, although on the whole it appears deficient in mineral strength. Often it yields a whitish-grey, loose, shallow, *rather unfruitful sand*; at times a strong, yellowish, *sandy loam*; and in some cases a red, loose, moderately deep, more or less *loamy sand*, comparatively free from stones, as in the vast forests of the Solling in Hanover, in Rheinhardtswald in Hessen-Cassel, and of the Spessart range. All three varieties (producing beeches) are seen in the Marksuhler Revier near Eisenach. This latter variety, on account of its strength, depth, looseness, and warmth, is well adapted to the growth of oak, which occurs extensively there in subordinate mixture with the beech, and produces timber of the best quality. On the loamy, sandy varieties, with less mineral strength, the timber is scarcely of first-rate quality. The best oak forests on such soils that we have seen are situated on the outlying hills of the Solling, bordering on the valley of the Leine, where the better kind of bunter sandstein gives place to the muschelkalk resting immediately above. Here the soil is a deep, fresh, fertile loam, formed by the soil having been washed down from the hills of muschelkalk and bunter sandstein into the valley. This *detritus* of muschelkalk and bunter sandstein has a subsoil of the latter rock. This oak forest (Forst Revier Rothenkirchen, Forstort Eselbreite) has an undergrowth of beech and silver fir to maintain the strength and freshness of the soil; both

standards and coppice show an excellent growth, and the timber formed is of good average quatity.

2. *The sands of the Keuper and Lias formations.*—The Keuper sand (Triassic system), in which the grains of quartz are united at one time by a siliceous, at another by a limy, and again by a clayey cement, and throughout which numerous deposits of marl and stiff potter's clay occur, necessarily forms on decomposition soils of varying quality. The lower portion of the formation yields a yellow, deep, loamy-marly soil of great fertility. This is very suitable for the oak, which here forms excellent timber, either mixed with beech, or as standards above an undergrowth of beech or Norway spruce. But it does not thrive on the poor, whitish, siliceous, coarse sand of the upper deposits, which are wanting in earthy substance, and become easily heated; such a soil scarcely affords nourishment to the Scotch fir. *The Lias sand* (*Oolitic system*) is, like the better varieties of the Keuper, extremely well suited to the growth of oak. It in general produces a more marly, yellowish, deep, fresh, sandy loam. *Greensand* (*cretaceous group*, Ger. *quadersandstein*) is fine grained, and contains a scanty clayey or siliceous cement. The more quartzose varieties are not easy of decomposition, while the clayey kinds are soft, and soon form a loose, poor, very sandy soil, apt to become dry, and which is on the whole less fertile than bunter sand of the dark red kind, being not well adapted for the rearing of oak timber. It occurs extensively on the Deister hills near Hanover, and beeches are chiefly cultivated on it, with spruce and Scotch fir on the worst spots.

Among the more sandy soils of the Tertiary and post-Tertiary periods are :—

3. *The Quartz-sand or Aretaceous Quartz of the North German plain*, containing frequently 90 per cent. and upwards of quartz, and therefore not suitable for the oak, being loose, dry, and barren. Over some parts of the plain, however, oaks are found in excellent growth, as in the Mark Brandenburg, see page 288. This was long held as anomalous, but in analysis by Prof. Seuft, of the Forest School of Eisenach, such sand was found to contain 17 per cent. of grains of feldspath.

4. The fertile, *loamy sands*, which produce oaks of immense size. Here the tap-roots find an easy passage through the deep, fresh soil, and the rootlets convey abundant supplies of moisture through the ascending axis to the leaves. Here the oak has the greatest annual increase of growth, and produces excellent timber. Over such a soil are the largest oaks of north Germany. They grow in *Eilenriede*, a pleasure wood adjoining the town of Hanover.

Limy Soils.—These we may subdivide into three heads :—

1. *Clayey limes*, produced by the more easily decomposible

greyish, brownish, or reddish coloured limestones and clayey marls, which occur in the muschelkalk, lias, Jura, and in the more recent formations.

2. The loamy, yellow *dolomitic limes*, yielded by the grey, yellow, brown, or blackish dolomitic limestones and marls occurring in the Triassic and Jurassic systems.

3. The more *stoney varieties* arising from the imperfect decomposition of the light grey limestones, which are found more or less in all the above-named formations, but especially in the muschelkalk.

1. *The clayey limes* are binding, earthy, less stony, moderately deep, strong mineral soils, which, when kept well in shade, are fresh, mild, and fertile. As it is binding, the oak is not in general found thriving as well on this variety, although single stems may occasionally grow to a good size. For example, during last summer we found an oak (Strahlenheimer Forst bei Nordheim) *on shallow Muschelkalk* resting on a subsoil of moderately cleft and tilled lime blocks, which at 4 feet from the ground had a girth of 33 feet, or $10\frac{1}{2}$ ft. in diameter, and was still growing well. The clayey limy soils formed by the clayey marls, on the other hand, are less binding, and hence more suited for the growth of oak timber.

2. *The yellow loamy dolomitic limes* are usually deep, mild, less binding, and fresh, so that they offer a favourable soil for the oak, except on such places as are rendered shallow by horizontal blocks of limestone forming the subsoil. Less favourable to the growth of this tree than the dark, fertile varieties of bunter sandstein, the dolomitic limes are better able to nourish the oak than the more binding limes and clays can be.

3. The more *stony varieties* are poor, shallow, less earthy, and dry, and are decomposed with difficulty—they want moisture and depth, and the idea of rearing oak timber on these should not be entertained.

Clayey and Marly Soils.—Throughout the rocks of the Mesozoic period deposits of slatey clays, potter's clay, and marls frequently occur imbedded among the limestones and sandstones, especially forming the transition from the one kind of rock to the other.

1. *The Slatey clays*, of a red colour from the presence of ferric oxide, and having a finely laminated structure, are chiefly met with in the bunter sandstein formation. Such clays are also often seen in the Carboniferous system, but then they are dark-coloured and bituminous, having much in common with the more recent clays, (*e.g.* of the Keuper), which we have termed potter's clay. The former varieties yield on decomposition a loose, red, friable, not a binding or plastic clayey soil, sometimes deep, at other times shallow, and often dry. Where the latter is the case, the oak does not find a home. By the

careful cultivation of Scotch firs, Norway firs, and later on of beeches, the soil becomes enriched with vegetable mould, which binds it together, and enables it to retain atmospheric moisture. The oak then finds an adequate supply of nourishment, and its growth similar to that over the second variety of soil mentioned while treating of the Permian system.

2. *The Marls* accompany nearly all the limes; in the more recent formations, (*e.g.* Keuper), and play a more important part. On decomposition, they in general furnish a deep, fresh, moderately binding, very fertile clayey, limy, or loamy soil, admirably suited for the rearing of oak forests. But what tree would refuse to grow on such a fruitful soil? It is chiefly reserved for agriculture, and the forests are mostly confined to hillsides too steep for the plough. It occurs abundantly around Eisenach in Saxe-Weimar, but rarely as forest land, and then producing beech timber with oaks interspersed.

3. Under the term *potter's clays* we include the clayey, bituminous, slatey marls, (*e.g.*, of the lower Keuper formation), which form a fertile clay, apt, however, to become wet. It is much too binding for the oak, and is mostly used for agriculture.

The interspersion of the Oak in Beech Forests.—Mixed forests ought to consist of trees which—(1) Thrive well on the same soil and situation; (2) Show no essential difference in their rates of growth; (3) Fall to the axe at the same time, or in a multiple of that time; (4) Have different root systems, so that one tree may draw nourishment from the upper layer of soil, and the other from the lower.

The advantages gained by such mixed forests are—(1) The production of a greater quantity of timber, occasioned by the difference in the root systems, and by the fact that the different trees do not seek the same nourishment in equal quantities; (2) Such forests suffer less from the attacks of insects; (3) The resistance offered to storms, arising from the difference in the root systems; (4) the timber is applicable to many more uses than if it had been grown in pure forests, and thus a higher revenue is realised.

The oak is found generally in company with the beech, rarely among silver firs or Norway spruces. On the whole, the oak grows more rapidly than the beech, except (α) in exposed situations, and (β) on shallow soils. However, it is necessary to protect the former against the latter.

1. By mixing young oaks of 6 to 8 ft. in height with young beeches of 4 to 5 ft. As the former has to remain twice as long as the latter, the oaks should be reared in small circular groups; for experience has shown that at the time of the natural reproduction of the beech such groups do least damage to the young

plants by overshadowing them, and the oaks can then be treated as mentioned in 2 *β*.

2. By rearing a pure oak forest, and then sowing or planting young beeches underneath; and this either (*α*) when the oaks are from 25 to 40 years old—that is, as soon as herbage begins to cover the surface of the soil. In this case planting is to be recommended in preference to sowing. Before the commencement of the planting operations the forest should be well thinned; or (*β*) when the oaks have nearly ceased to grow in height, which happens at the age of seventy to a hundred years. After weeding out all soft woods, &c., that may have been nurses to the young oaks, or which may have stolen into the forest, favoured by the light thin foliage of the latter, a thinning of the oaks is made. These two fellings remove from $\frac{1}{3}$ to $\frac{1}{2}$ of the trees. At the latter clearance, or a little earlier, the beech (also the spruce, the silver fir, or the hornbeam) is sown or planted underneath. Where the shadow thrown on the ground by the oaks is at all considerable, planting is to be preferred. Later clearances of the standards are made, when necessary, similar to those carried out in connection with the natural reproduction of the beech, with this difference, however, that the young beeches are not meant to acquire the dimensions of timber trees of the first order (*i.e.*, above 60 ft.), but merely to serve for the protection and improvement of the soil.

3. By reproducing the oak by natural means in mixed forests of beech with oak, and by nursing it at the cost of the surrounding beeches.

4. By sowing it on sunny spots during the preparatory fellings in the natural reproduction of the beech.

5. By planting it on similar places during the subsequent clearances of the beech.

6. By favouring it as much as possible in all thinnings, whether in youth or at a more advanced age.

If oaks have not been grown in groups, but scattered singly among beeches, and if the latter be suddenly thinned to aid natural reproduction, or for any other reason, the oaks which, it may be accepted, are then from 100 to 120 years old, and which must first reach a riper age ere they fall by the axe, become dry in the crown, and the trunk sends forth a proportionate quantity of shoots. The reason is obvious—as long as the trunk has enjoyed the side shade of the beeches, it has shot rapidly upwards, and all the buds have not been able to develop themselves. The dormant buds now exposed to the sunlight become fully developed, and making use of the sap on its upward progress, little finds its way to the summit of the tree. The removal of these shoots has been found of no avail, as others are rapidly formed; experience has shown, however, that in a

few years the normal development of the "stag-headed" crown again takes place. Some hold that the quality of the timber is affected, but this is probably a mistake. This temporary evil is remedied, or rather avoided, by accustoming the oaks gradually to entire freedom.

In considering the effects of various soils on the remaining hardwoods, we shall not detail so fully the decomposition of the different rock formations, &c., which would involve a repetition of what has been said in regard to the oak and the beech.

Ash (*Fraxinus excelsior*), Maple (*Acer platanoides*), Sycamore (*Acer pseudoplatanus*), and Elm (*Ulmus*). These four trees have much in common, they are found growing on similar soils, and are frequently associated in subordinate mixture with beech in timber forests, where the treatment accorded to them is similar, and they may be classed together. A short description of their specialities may, notwithstanding, precede general remarks as to the nature of the most suitable soils.

The Ash (*Fraxinus excelsior*) is, like the oak, a hardwood that must not be reared in pure forests, as it must have a large supply of light, and its foliage is so thin and scattered as to be incapable of preserving the moisture and mineral strength of the soil; hence it is most frequently found single, or in groups in beech forests. As standards in composition forests, the ash finds a most suitable situation; freely exposed to the light, it speedily acquires fair proportions; thin in foliage it does not oppress the undergrowth. Even among coppice it yields a good return, if not too much shaded by the standards.

The ash is reproduced readily from the stool, and its culture in coppice woods with the oak, maple, hazel (*Corylus avellana*), lime (*Tilia europæa*), sycamore, elm, hornbeam (*Carpinus betulus*), and beech is attended with good results. It is most liable to injury from the rapid growth of grass. Dry or poor soils are not suitable, it desires a moist, at times even a wet soil; its true home is on rich, loose, strong mineral soils, abounding in humus, and even on binding ones if fertile. In mountainous districts it ascends as high as the oak and the beech. On marshy soil it is often found with the alder (*Alnus*); here, however, it occupies moist and not absolutely wet spots, which are properly the sphere of the alder. The usual sign of an unsuitable situation is the gradual drying up and decay of the crown, while the trunk gives forth a quantity of young shoots.

The Maple (*Acer platanoides*), and the Sycamore (*Acer pseudoplatanus*), are varieties which must be placed above the ash in regard to the amount of shade they can bear; in fact, in some parts of Holland they are found on fresh, strong, mineral soil, as underwood in oak forests. But this is not their normal situation; they cannot bear shade like the beech or hornbeam, and on the

whole they must be classed among trees that need much sunlight, and have light foliage. Where they grow in shade, the ground must be exceedingly favourable. For this reason they are not met with in extensive pure timber forests, but often on rich soils, especially lime, scattered among beeches, singly or in groups.

As standards in composition forests they (especially the sycamore) yield a wood much valued for cabinetmaking and carving; here they thrive on suitable soil, and do not injure the underwood by casting too much shadow on it. Even as part of the coppice they return a good revenue, for they produce numerous shoots from the stool, and are not so much injured by shade as the ash or elm.

Among underwood and in coppice woods we find with the maple and sycamore the Norway maple (*Acer campéstris*), a tree of the third, rarely of the second class. (The third class includes all trees not usually exceeding a height of 30 feet; the second class, from 30 to 60 feet; and the first class, from 60 feet upwards). The maples are not, however, to be looked for in pure coppice woods, but rather with oak, ash, elm, hornbeam, beech, lime, hazel, *Cornus sanguinea*, *Rhamnus frangula*, &c., &c. Their culture is rewarded on fresh, strong mineral soils, such as lime, basalt, &c.; in other words, over those soils which are best suited for the beech, although even on the better, fresher varieties of the bunter sandstein they rarely occur. A high degree of moisture the maples do not, on the whole, bear so well as the ash and the elm.

The maple grows chiefly on low hilly land and on plains, and extends further north than the sycamore, which seeks the more mountainous districts, and grows at higher elevations. The former, although preferring a strong mineral soil, and there often found with the sycamore, thrives also on fresh, mild loams, and even on the better moist varieties of sand, if rich in vegetable mould. The sycamore makes greater claims on the soil in mineral strength and moisture than the maple. In mountain districts, (*e.g.* Lauterberger Revier am Harz), they are more frequently met with on the cool, fresh north and east slopes than on south or west aspects. In dry exposed situations, or very near the sea, neither of the maples shows a lively growth.

Elm (*Ulmus*).—The wood of the elm has always been highly prized, on account of its fine colour and texture, and of the length of time it endures exposure to the atmosphere.

Of the numerous varieties the English elm (*U. campestris*) and the spreading elm (*U. effusa*) are chiefly seen in the woods, the cork elm (*U. suberosa*), and the Wych elm (*U. montana*) being ss common. The cork elm is generally regarded as a variety *U. campestris*.

The English elm (*U. campestris*) has the most extensive range,

and may be taken as representative for the others. In mountain districts, as the Harz, it ascends to a good height on fresh, strong mineral soil, but on gentle hilly slopes and on plains it grows well on less strong varieties. Like the oak, it has a tap-root, requiring a deep soil, not too binding. It at the same time prefers, like the ash, a rather moist situation, although it does not thrive in marshy districts. Lime, basalt, diabas, loam, and the better kinds of sand, with a plentiful admixture of humus, are the soils best adapted for the elm.

It is as little suited for pure forests as ash and maples, and, like those trees, chiefly occurs mixed with beeches, and then more frequently single than in groups. As standards in composition forests it finds a suitable place, where it soon acquires such dimensions as secure high prices for its timber, which, like that of *Dalbergia latifolia* in India, is highly prized for the manufacture of gun carriages. As underwood, on rich soil it bears the shade of standards fairly, and also shoots well from the stool. In mixed coppice the elm is extensively grown, although the power of reproduction soon diminishes gradually; while this is in vigour it has a tendency to send out young shoots at a great angle from the stem, which are apt to prevent the growth of the surrounding coppice. Along the banks of streams, and in moist situations, elms are frequently pollarded for the production of timber prized for cabinetmaking, &c., the knots in pollard timber being due to numerous arrested adventitious buds.

Soils best adapted for Ash, Maples, and Elms.—In beech forests, the ash, maples, and elms are met with on the better varieties of granite, of coarse structure and rich in orthoklas, especially on the north side, in the bends made by the hills, where the soil is always richer, moist, deeper, and containing more vegetable mould. Quartzy granite of a fine structure decomposes slowly, and is not suitable for these trees; but where granite gradually passes into syenite they are often well grown. On the mild clay of the gneiss they are frequently met with, as in parts of the Thuringer Wald, but they avoid the generally shallow mica-slate; where they in the latter case grow at all well, it may be accepted that the mica-slate is giving place to the richer talc, or to chlorite slates.

On the various kinds of porphyry they sometimes thrive, while at other times they do not occur at all. When the porphyry is fine-grained, the soil is generally poor and extremely shallow, so that scarcely any tree, however moderate may be its claims on mineral strength, can thrive. Felsitporphyry and micaporphyry approach more to the clayey kinds, and yield a fresh, earthy, strong soil, on which ash, maples, and elms prosper among beeches, as often seen throughout Thuringen and the Harz. The mild, earthy, fertile kinds of clay porphyry offer an

excellent situation for them, and here they show a growth second only to that on lime, basalt, and diabas. Diorite, seldom occurring extensively, and always yielding a poor, stony soil, is scarce suited for any of our forest trees, certainly not for those that make great claims on mineral strength. Ash, maples, and elms thrive on the strong, fresh, fertile soils produced by the decomposition of basalt, (Bromberg am Solling), diabas, or melaphyr (Ilfeld am Harz, see page), and these may be considered some of the natural situations of those trees; they are clayey, but contain in general an admixture of lime.

In favourable situations they grow well over the mild, blueish soils of the clay slates of the Laurentian and Cambrian systems, but not on the shallow, stony, quartzy varieties. On the loose, shallow, stony kinds of the Silurian and Devonian systems they ought not to be reared, but their cultivation on the more sandy or loamy soils of the sandstones and conglomerates will be much better rewarded, as may be proved by inspecting some parts of Oberforsterei Lauterberg am Harz. The Permian system does not, on the whole, yield a favourite soil for the trees under consideration; occasionally they grow well on fresh northern slopes on the clayey soils of the slaty clays and clayey sandstones (parts of Eisenacher Forstrevier); but on those poorer in every respect arising from the decomposition of the more quartzy conglomerate they are not to be looked for.

Sandy Soils.—The sands, loamy sands, and sandy loams of the bunter sandstein are not so well adapted for them, although on the better, fresh, loamy varieties, where the muschelkalk begins, maple, sycamore, and elms are occasionally met with among beeches, much less frequently, however, the ash. (Forstrevier Rothenkirchen, Hanover).

The deep, yellow, fertile, loamy Keuper sands seem more favourable to the growth of ash, maples, and elms, which here often yield most valuable timber; on the upper sandy deposits they do not thrive, as these are less earthy and more siliceous. (Forests N. W. of Eisenach). The fresh, more or less marly, sandy loams of the Lias sands are remarkably well adapted for their growth, and here timber of high value is produced, as on the better Keuper sands. The looser sands of the greenstone (Deister Hills, bei Hanover) are by no means the home of the ash, maples, and elms, which are rare on that range of hills. The deep, fresh, loamy sands of the Tertiary and post-Tertiary systems nourish them well, and here they may be grown extensively. Not so, however, in regard to the dry, loose, quartzy sands of the north German plain, where they do not occur as forest trees.

Limy Soils.—The less stony, fresh, fertile, strong mineral soils of the clayey limes of the muschelkalk, Lias, and more recent formations may be viewed as the true home of ash, maples,

and elms. Here they may be mixed on northern slopes in a higher percentage than elsewhere in beech forests. The soil is strong and rich in humus, and when the ground is well guarded against the influence of the sun's rays, it is fresh, at times even moist, and capable of producing the finest timber, especially where the subsoil is a little cleft, and not in unbroken more or less horizontal layers.

They also thrive well on the fresh, milder, more loamy dolomitic limes (*e.g.*, Altenstein, in the Thuringer Wald), but on the shallower, more strong varieties, which are usually dry, they seldom occur; this remark applies especially to the deep-rooting elms.

Clayey and Marly Soils.—The slaty clays, chiefly of the bunter sandstein formation, with their loose, red, friable clayey soil, are, when rich in vegetable mould, and thus rendered fresh and a little binding, suitable for the cultivation of the trees under consideration (*e.g.*, many parts of Solling Hills near the Weser). Where the deep, fresh, highly fertile, clayey, limy, or loamy soils, arising from the marls that occur so abundantly in the more recent formations are still forest ground, they find an admirable soil, which satisfies the requirements of any of our forest trees.

Mixed Forest of Beech, Ash, Maples, and Elm.—Seeing that these trees satisfy tolerably well the rules which nature seems to have laid down in regard to mixed timber forests, and which we have given when treating of the oak in beech forests, we now notice how they are to be introduced into beech forests, and how treated when found there. When the fellings preparatory to the natural reproduction by seed of the beech are completed, and a seed year for the beech is at hand, as may be seen during the winter and spring, the seed of the ash, maples, and elms should in the course of the spring be sown here and there, singly rather than in groups, for, owing to their light, thin foliage, they would in later years allow the sun to impoverish the soil. By these means they get a slight advance of the beech, and having a thin foliage, do not inflict much injury by overshadowing it. Where these young plants are, however, the after clearances must not be long delayed, for they do not bear the shade well. Should the natural reproduction of the beech already have taken place, it is not too late to come with the above-mentioned trees, but then it must be by means of planting here and there, on spots exposed to the sunlight they should be planted, always allowing them a year or two in advance of the surrounding beeches. Later on, at all thinnings, they, if in good growth, must have a free crown, even at the expense of a few beeches. As they are capable of producing good seed sooner than the beech, from the fiftieth to the seventieth year onwards, while by the latter it commences with the

seventieth to the ninetieth year, and as they do not continue in good growth so long as that tree, such mixed forests ought to have a term (*turnus*) of about ninety years. In the natural reproduction of such forests the ash, maple, sycamore, and elms should be first reproduced, and the young plants from their seed should have abundance of sunlight allowed them. On account of the value of their timber such mixed forests yield a large revenue.

Hornbeam (*Carpinus betulus*).—Like the beech the hornbeam is chiefly employed for fuel in Germany, owing to the fact that it seldom attains suitable dimensions for the better class of timber. We lately met an engineer who for some time had been desirous of obtaining logs of hornbeam 30 ft. × 16 inches square, but was unable to find them. Unlike the beech, however, it is here not met with in unmixed forests; only far to the east, where the growth of the beech in pure forests over large areas begins to cease, as in Russia, where it takes the place of the latter tree, does it occur in pure forests. Closely allied to the hornbeam is *Ostrya vulgaris*, which occurs as a forest tree principally in South Germany.

Owing to the hardness of its wood, the hornbeam is not much esteemed as fuel by the German peasants, although it produces more heat than the beech; in sawing and cutting it in small pieces the tools lose their edge. To rear it for timber would be unprofitable; in addition to its slow growth it has a short life, eighty years being a high average. It is used for cogs and toothed wheels, screws, axe-handles, joiners' tools, shoe-lasts, and the like. It is often regarded by the forester as an enemy against whom strong measures must be taken; but the hornbeam, when it has once gained a footing in the soil, is tenacious of life. It steals into beech and oak forests, especially when growing in fresh, humous soils, and prefers the fertile plains and undulating hillsides to the higher mountain slopes. It seldom grows in sour, marshy ground, but not unfrequently around such places, and ought to be cultivated there as a nurse to any of the more valuable timber trees (*e.g.*, ash), which thrive well on moist or even wet soils, for it suffers less than any other hardwood from late frosts. Where, however, the soil is too wet, the hardwood should not be reared, as their timber would not be valuable; the alders (*Alnus glutinosa* and *Alnus incana*), with their more rapid growth, although soft woods, produce a better revenue.

We may designate the hornbeam the hardiest of our hardwoods; late frosts, the damage done by cattle and sheep grazing where it is growing, or by roebucks beating the *bast* from off their horns in the spring, aye, the axe of the woodman, injure it less than they do any other tree. The injuries done to it in earliest youth by mice and cattle often affect it seriously, but if fairly rooted, it reproduces itself from the stool. Seeing that the power of springing from the stool is so great, it is well adapted for the for-

mation of coppice. As hinted, however, where more valuable trees will grow, the hornbeam is not much cared for, and even in coppice we do not find it in pure woods, but generally associated with beech, oak, hazel, lime, ash, maples, elm (*Rhamnus frangula, Cornus sanguinea,* &c.), a mixture well suited for the south side of a hill with limy soil. On commons and places used for pasture, it may be pollarded with a term of about nine years, as is usual in Germany.

Its leaves form a soil-improving humus, and as it bears the shade of standards as well as beech, it is admirably suited for forming the underwood in composition forests, or in oak or other forests which, if pure, or thickly interspersed with a soil-improving tree, require the aid of a shade-bearing covering to the soil. Eighty years we consider as the average life of the hornbeam; that of the beech 120 years. Now, on strong mineral soil, if dry, the beech must come to the axe much sooner, if we do not wish to be compelled in after years to call in the aid of a conifer for a generation to improve the soil. Here, then, it is that the hornbeam must be suffered to dwell, along with its nobler relative, in whatever capacity it chooses, as underwood or as timber tree,—anything that will keep the soil in shade and help to retain the atmospheric moisture.

Although an aid to the beech on a strong soil inclined to dryness, the natural home of the hornbeam is over fresh or moist humous, strong mineral soils of any kind. Sands or clays, marls, loams or limes, if fresh and humous, are alike its home. As regards the shape of the stem itself, it never has a cylindrical shape, the circumference, no matter over what soil it grows, being always more or less wavy.

In the hollows formed on granite hills a good fresh clayey soil collects, where the beech, with ash, maples, and elm is usually cultivated, and where the hornbeam, bearing seed early and often, steals in and has a good growth. The same may be said of the clayey porphyries, with their fresh and often moist fertile soils. Diabas, melaphyr, and basalt yielding their dark red clayey soils, containing a little lime, and on the whole fresh and fertile (*e.g.*, Gäbelskuppe, between Eisenach and Marksuhl), also produce hornbeams of good growth, although, to the exclusion of more valuable timber, allowable only on spots visited by late frosts, and on those places where wind, &c. may have overthrown or killed single stems.

Around Eisenach, where the Rothtod liegendes on the outskirts of the Thuringer Wald undulates very much, it occupies many of the hollows, that, however fresh and fertile the dark red clayey varieties, are not suitable for the less hardy trees. This is frequently observed in many parts of the *Lehrforste der Eisenacher Forstlehranstalt.* On the better, dark red, clayey sand of the bunter sandstein it again endeavours to push its way among the

beeches, and occasionally produces a fine stem, (*e.g.* Rothenkirchener Forstrevier, Forstorte Uhlenstocke, Ahlsburg, Fuchslocher, and Hanebach); on the lighter-coloured, poorer varieties it does not thrive so well, but is useful underwood for improving the soil.

III. The Relations between Soils and Subsoils, and their effects on Timber.

In the preceding pages we have directed attention almost solely to the *soils* suitable for the various hardwoods reared in forests; now we examine shortly the relations between soils and subsoils, and the combined effect they produce on the timber reared over them. Where the soil is dry, or apt to be rendered dry by the sun's rays, the subsoil must be moist and capable of supplying the roots of the trees with a sufficient quantity of moisture for their nourishment. If it have a disposition to become wet, an undersoil which can absorb and retain a large quantity of moisture is highly desirable. The underlying layers may be of the same rock, whence has arisen the soil by decomposition, or of a different nature—it may be impervious, or cleft, horizontal, inclined, or tilted. An impervious subsoil is never desirable, and ought to be broken through before sowing or planting operations are commenced. A cleft undersoil may in some cases be extremely useful, in others it works deleteriously. Thus, if a wet peat, or marsh, or a still clay apt to become saturated with rainwater, and so give rise to swampy, marshy ground, be above, a cleft subsoil works most beneficially in conducting away a large quantity of the superfluous moisture, and in rendering it less tenacious and plastic; imperfectly decomposed organic remains in the peat have then a better chance of being acted on by the atmosphere. Again, if the under-soil be much cleft, an immoderate supply of moisture is drawn from the surface-soil, and conducted far down into the rock, in consequence of which, (as may be well seen in the case of Norway spruces (*Picea excelsa*), in many parts of the Eisenacher Forst, the trees remain dwarf, the material that ought to increase the stem, in height and girth, being employed in the formation of roots, which, spreading far and wide in search of moisture, are strangely disproportionate to the size of the tree.

Horizontal layers are apt to collect an over-supply of moisture, on account of which the quality of the timber is injured; this evil is, however, not by any means so observable where the soil is deep, loose, and therefore inclined to be dry. If it be shallow, wet, or plastic, an inclined or tilted underlayer is more favourable to the growth of timber.

Massive rocks, such as granite, diabase, basalt, porphyry, &c., are generally but moderately cleft, remain moist, and form good under-soils; many clays are, however, plastic and impervious, so

that if the soil be not deep the amount of moisture collected is apt to become too great.

Underneath the sand of the North German plain there occurs in many districts (especially around Burgdorf, Uelzen, and Celle), an impervious layer of sand firmly cemented by heather humus, and containing approximately 2% of sesqui-oxide of iron, and known as moorpan. This, lying at the depth of from 6 inches to 2½ feet from the surface, has first to be broken up by the steam-plough, or the subsoil plough drawn by oxen, or, if too deep for that, by manual labour. The thickness of this impervious layer is usually 9 inches to 1 foot, and on exposure to the atmosphere for about one year it crumbles to a yellow sand, after which the soil is fit for growing the Scotch fir—which is here planted in preference to being sown. As it would be a needless expense to upturn the whole of the subsoil, the moorpan is brought to the surface in bands, 6 to 8 feet in breadth, and with a space of 6 feet between each, so that about ⅓ of the whole area is upturned. If performed by manual labour, this costs from L.3 to L.3, 10s. per acre. Again, on part of the same plain, in Mark Brandenburg, fine oaks grow over sand, which has 17% of kalkfeldspath, and a subsoil of peat and loam underneath.

The soil yielded by the red conglomerate of the Rothtodliegendes being shallow (and generally poor in earthy matter), usually rests on a subsoil of the same rock, and this, being capable of retaining moisture, tends to improve the surface soil, otherwise almost unfit for sylviculture. Peats, marshes, and moist clays are most favourable to the rearing of timber when over sand, or any other subsoil which absorbs and retains within itself the water which collects above.

Limes and loams form, as a rule, like marls, good subsoils, absorbing the moisture, and then giving it back again gradually when there is a necessity for it.

The effect which the soil and the subsoil have on the quality of timber may be expressed shortly but scientifically as follows:—The *combustible tissues* of timber, *i.e.*, those liable to decay either by exposure to atmospheric or other agencies are—*carbon*, *oxygen*, *hydrogen*, and *nitrogen*. The absolutely necessary constituents of the *ashes*, or portions of the timber not liable to decay, are—*iron*, *calcium*, *potassium*, and *sodium*; along with these are often to be found *magnesium*, *manganese*, *silicon*, *sulphur*, and *phosphorus*. It follows, then, that according as the percentage of combustible tissue exceeds that of the incombustible, the timber will be less durable, and hence for technical purposes of less value. Therefore, soils and subsoils in which there is a fair amount of lime, potassium, silica, &c.; in short, those *rich in alkalies*, produce timber of the best quality, while such as contain an over abundance of moisture yield timber neither of such durability, nor of so high a value.

AGRICULTURAL STATISTICS OF SCOTLAND,

OBTAINED ON 25TH JUNE 1875.

EXTRACTED FROM THE GOVERNMENT RETURNS.

TABLE No. I.—*Number of Holdings from which Returns were obtained.*

COUNTIES.	50 Acres and under.	50 to 100 Acres.	100 to 300 Acres.	300 to 500 Acres.	500 to 1000 Acres.	Above 1000 Acres.	TOTAL.
Aberdeen	7,331	2,344	1,776	115	19	...	11,585
Argyll	3,168	287	210	35	13	3	3,716
Ayr	1,543	722	1,070	116	63	55	3,569
Banff	3,185	547	456	31	2	...	4,221
Berwick	444	70	218	128	96	18	974
Bute	345	65	70	5	3	...	488
Caithness	2,209	155	137	39	29	8	2,577
Clackmannan	133	17	52	9	2	...	213
Dumbarton	414	128	179	3	3	...	727
Dumfries	1,402	444	645	84	25	5	2,605
Edinburgh	477	116	294	75	44	6	1,012
Elgin or Moray	1,449	304	277	32	8	...	2,070
Fife	1,307	217	643	192	32	1	2,392
Forfar	1,498	388	654	160	34	2	2,736
Haddington	237	31	134	111	50	3	566
Inverness	5,665	239	235	22	7	3	6,171
Kincardine	1,200	301	362	41	10	...	1,914
Kinross	143	29	118	25	1	...	316
Kirkcudbright	761	265	416	113	29	1	1,585
Lanark	1,463	713	854	64	12	1	3,107
Linlithgow	212	105	190	28	6	1	542
Nairn	248	81	76	8	...	...	413
Orkney	2,767	236	108	30	4	2	3,147
Shetland	3,765	34	30	7	2	1	3,839
Peebles	144	31	104	29	11	...	319
Perth	3,409	747	957	147	35	1	5,296
Renfrew	688	300	299	15	9	...	1,311
Ross and Cromarty	6,046	198	215	61	16	...	6,536
Roxburgh	636	115	240	103	80	13	1,187
Selkirk	147	21	34	11	14	...	227
Stirling	789	382	329	29	7	1	1,537
Sutherland	2,505	29	42	9	4	...	2,589
Wigtown	581	217	399	90	21	1	1,309
Total for Scotland	56,311	9,878	11,823	1,967	691	126	80,796

TABLE No. II.—*Total Acreage of each Class of Holdings.*

COUNTIES.	50 Acres and under.	50 to 100 Acres.	100 to 300 Acres.	300 to 500 Acres.	500 to 1000 Acres.	Above 1000 Acres.	TOTAL.
Aberdeen . .	123,029	140,651	279,471	41,763	10,898	...	595,812
Argyll, . . .	33,025	20,646	34,903	13,200	8,936	3,668	114,378
Ayr	23,009	54,335	166,158	35,159	21,080	7,275	307,016
Banff . . .	41,849	39,357	71,575	10,987	1,017	...	164,785
Berwick . . .	4,141	5,115	42,526	51,007	64,650	25,015	192,454
Bute . . .	5,676	5,405	9,547	1,914	1,725	..	24,267
Caithness . . .	26,047	10,899	23,141	14,383	19,704	10,042	104,216
Clackmannan . .	1,233	1,261	8,585	3,298	1,493	...	15,870
Dumbarton . .	4,928	9,890	27,822	1,204	1,832	...	45,676
Dumfries . . .	19,148	33,087	108,392	31,756	16,378	5,599	214,360
Edinburgh . .	6,324	8,412	53,169	27,826	29,828	8,615	134,174
Elgin or Moray .	20,042	21,867	44,715	12,037	4,839	...	103,500
Fife	13,268	16,008	118,629	72,662	20,678	2,500	243,745
Forfar . . .	19,831	28,158	120,439	58,809	19,804	2,372	249,413
Haddington . .	2,353	2,221	28,219	43,507	31,434	5,641	113,375
Inverness . . .	48,652	16,611	38,827	8,394	4,612	5,026	122,122
Kincardine . .	15,604	22,583	60,730	15,254	6,281	...	120,452
Kinross . . .	1,543	2,074	21,556	9,307	530	...	35,010
Kirkcudbright . .	11,377	19,874	75,218	43,049	18,453	2,014	169,985
Lanark . . .	22,624	54,245	134,006	23,825	8,340	1,532	244,572
Linlithgow . .	3,194	8,034	32,531	9,685	3,861	1,080	58,385
Nairn . . .	4,210	5,901	12,201	3,583	—	...	25,895
Orkney . . .	43,847	16,183	17,764	11,247	2,323	2,254	93,618
Shetland . . .	36,482	2,488	5,359	2,329	1,196	4,402	52,256
Peebles . . .	2,236	2,302	19,276	11,000	6,773	...	41,587
Perth . . .	38,162	55,953	163,275	50,077	22,975	1,448	331,890
Renfrew . . .	10,633	23,094	45,296	5,488	5,580	...	90,091
Ross and Cromarty .	40,326	13,966	36,911	23,883	9,183	...	124,269
Roxburgh . .	7,695	8,522	44,525	41,086	53,743	18,571	174,142
Selkirk . . .	1,436	1,661	5,552	4,435	9,499	...	22,583
Stirling . . .	13,130	28,493	52,080	10,411	4,299	1,418	109,831
Sutherland . .	11,994	2,069	6,939	3,576	2,212	...	26,790
Wigtown . . .	9,308	16,255	70,744	33,744	13,322	1,203	144,576
Total for Scotland	666,356	697,620	1,980,081	729,885	427,478	109,675	4,611,095

TABLE No. III.—*Number of Horses used for Agriculture, of Mares kept for Breeding only, and of Unbroken Horses.*

COUNTIES.	50 Acres and under.	50 to 100 Acres.	100 to 300 Acres.	300 to 500 Acres.	500 to 1000 Acres.	Above 1000 Acres.	TOTAL.
Aberdeen	5,603	5,982	10,731	1,363	261	...	23,940
Argyll	3,578	1,378	1,439	231	210	31	6,867
Ayr	928	1,596	4,303	698	418	220	8,163
Banff	2,176	1,761	2,902	390	35	...	7,264
Berwick	259	222	1,471	1,454	1,566	347	5,319
Bute	315	271	357	19	18	...	980
Caithness	2,470	594	866	385	463	166	4,944
Clackmannan	78	58	395	99	52	...	682
Dumbarton	212	421	946	27	22	...	1,628
Dumfries	1,002	1,524	3,589	792	207	55	7,169
Edinburgh	362	364	1,924	741	579	30	4,000
Elgin or Moray	1,174	1,087	1,884	386	119	...	4,650
Fife	828	2,168	4,338	1,870	679	5	9,888
Forfar	1,092	1,239	4,987	2,015	604	48	9,985
Haddington	154	90	1,091	1,418	845	73	3,671
Inverness	5,855	945	1,642	259	91	47	8,839
Kincardine	614	947	2,441	499	194	...	4,695
Kinross	60	82	731	282	...	...	1,155
Kirkcudbright	664	864	2,365	985	306	4	5,188
Lanark	820	1,861	3,798	571	117	...	7,167
Linlithgow	133	309	1,170	313	75	32	2,032
Nairn	306	330	503	109	...	...	1,248
Orkney	3,417	914	742	389	109	43	5,614
Shetland	4,781	162	408	295	13	120	5,779
Peebles	89	86	595	239	116	...	1,125
Perth	2,392	2,864	6,215	1,567	501	17	13,556
Renfrew	586	852	1,360	174	112	...	3,084
Ross and Cromarty	3,348	803	1,774	908	247	...	7,080
Roxburgh	434	334	1,338	952	1,194	269	4,521
Selkirk	118	74	163	110	144	...	609
Stirling	747	1,298	2,046	268	90	22	4,471
Sutherland	1,980	102	295	88	57	...	2,522
Wigtown	588	770	2,771	1,062	321	30	5,542
Total for Scotland	47,163	32,352	71,580	20,958	9,765	1,559	183,377

TABLE No. IV.—*Number of all Kinds of Cattle for each Class of Holdings.*

COUNTIES.	50 Acres and under.	50 to 100 Acres.	100 to 300 Acres.	300 to 500 Acres.	500 to 1000 Acres.	Above 1000 Acres.	TOTAL.
Aberdeen	41,306	41,836	74,298	10,147	2,038	...	169,625
Argyll	32,443	12,544	11,987	3,115	1,809	405	62,303
Ayr	12,374	17,900	43,320	6,979	4,316	2,398	87,287
Banff	13,138	10,680	18,279	2,420	234	...	44,751
Berwick	1,076	780	4,661	3,856	5,137	1,289	16,799
Bute	2,617	1,572	3,164	145	399	...	7,897
Caithness	8,805	2,645	4,266	1,970	2,605	1,061	21,352
Clackmannan	514	238	1,670	702	217	...	3,341
Dumbarton	2,276	3,188	6,894	282	335	...	12,975
Dumfries	9,127	10,416	24,533	6,137	2,188	1,005	53,406
Edinburgh	2,339	1,661	6,239	2,669	1,992	308	15,208
Elgin or Moray	6,173	5,630	9,648	2,436	659	...	24,546
Fife	3,504	3,200	19,594	10,179	2,737	178	39,392
Forfar	6,875	6,937	23,022	10,147	2,669	205	49,855
Haddington	641	266	2,385	2,928	1,525	263	8,008
Inverness	33,151	6,168	9,530	2,068	1,026	816	52,759
Kincardine	5,168	6,372	13,937	3,405	1,173	...	30,055
Kinross	545	516	4,012	1,373	135	...	6,581
Kirkcudbright	5,032	6,343	17,265	8,072	2,981	23	39,716
Lanark	9,208	15,786	32,170	4,717	1,210	573	63,664
Linlithgow	1,419	2,111	5,656	1,267	496	364	11,313
Nairn	1,370	1,769	2,828	615	...	...	6,582
Orkney	14,970	4,210	3,891	2,003	445	243	25,762
Shetland	19,982	516	630	227	69	38	21,462
Peebles	765	549	3,575	1,291	502	...	6,682
Perth	16,783	16,649	34,557	8,701	4,893	316	81,899
Renfrew	5,279	6,483	10,777	1,092	1,324	...	24,955
Ross and Cromarty	26,458	3,287	6,590	3,861	1,091	...	41,287
Roxburgh	2,937	1,796	5,321	2,995	3,231	782	17,062
Selkirk	765	398	651	446	372	...	2,632
Stirling	7,000	8,558	11,830	1,984	815	94	30,281
Sutherland	10,306	579	1,317	384	598	...	13,184
Wigtown	3,621	5,323	19,648	8,307	2,787	234	39,920
Total for Scotland	307,967	206,906	438,145	116,920	52,008	10,595	1,132,541

TABLE No. V.—*Number of Sheep and Lambs for each Class of Holdings.*

COUNTIES.	50 Acres and under.	50 to 100 Acres.	100 to 300 Acres.	300 to 500 Acres.	500 to 1000 Acres.	Above 1000 Acres.	TOTAL.
Aberdeen	47,178	27,613	57,275	19,095	9,217	...	160,378
Argyll	610,579	213,100	121,286	42,966	31,045	4,510	1,023,486
Ayr	59,229	18,465	76,415	39,125	43,788	115,686	352,708
Banff	14,143	13,575	21,637	4,406	571	...	54,33[illegible]
Berwick	7,445	3,944	50,508	70,850	107,384	30,528	270,659
Bute	7,752	8,152	17,731	6,063	2,606	...	42,304
Caithness	16,152	3,484	23,840	19,946	24,569	9,518	97,509
Clackmannan	6,895	91	3,722	1,172	660	...	12,540
Dumbarton	36,935	17,014	15,713	1,161	1,269	...	72,09[illegible]
Dumfries	162,017	104,336	139,881	43,726	21,033	6,511	477,504
Edinburgh	13,564	7,118	41,883	31,037	59,082	11,176	163,860
Elgin or Moray	18,164	6,698	22,886	6,957	5,022	...	59,727
Fife	1,857	1,592	25,064	25,524	12,524	2,400	68,961
Forfar	27,573	22,509	41,110	19,103	8,773	735	119,803
Haddington	6,391	1,087	26,764	28,055	35,656	6,529	104,482
Inverness	388,331	155,499	154,213	22,458	5,619	5,930	732,050
Kincardine	985	4,541	23,399	5,816	1,433	...	36,174
Kinross	1,057	993	18,636	7,932	95	...	28,713
Kirkcudbright	129,824	54,102	107,842	43,143	18,750	2,800	356,461
Lanark	66,298	45,107	67,409	17,657	12,050	1,872	210,393
Linlithgow	1,086	1,067	8,307	5,312	3,643	1,049	20,464
Nairn	2,024	2,642	11,223	1,925	...	...	17,814
Orkney	13,694	2,944	5,561	6,874	1,395	1,430	31,898
Shetland	63,525	4,086	12,297	5,027	1,720	969	87,624
Peebles	45,810	12,736	67,452	34,436	15,918	...	176,352
Perth	284,552	132,675	187,732	45,230	30,561	806	681,556
Renfrew	9,341	5,910	12,303	3,257	5,648	...	36,459
Ross and Cromarty	232,666	60,616	46,174	22,797	6,062	...	368,315
Roxburgh	81,184	54,952	128,343	87,354	101,715	33,242	486,790
Selkirk	56,483	21,870	40,823	12,302	23,983	...	155,461
Stirling	35,192	38,267	23,009	12,389	1,861	7,951	118,669
Sutherland	116,328	23,738	58,081	36,272	5,628	...	240,047
Wigtown	19,372	28,215	50,095	19,755	9,436	745	127,618
Total for Scotland	2,583,626	1,098,738	1,708,614	749,122	608,716	244,387	6,993,203

TABLE No. VI.—*Summary of Total Acreage under each Principal Crop, and of the Number of Live Stock returned in Great Britain, in each Year from* 1871 *to* 1875.

	1871.	1872.	1873.	1874.	1875.
PRINCIPAL CROPS.					
Wheat.	Acres.	Acres.	Acres.	Acres.	Acres.
England	3,312,550	3,336,888	3,252,802	3,391,440	3,128,547
Wales	126,334	126,367	116,852	117,869	111,797
Scotland	133,010	135,702	120,726	120,991	102,137
Great Britain	3,571,894	3,598,957	3,490,380	3,630,300	3,342,481
Barley or Bere.					
England	1,964,210	1,896,403	1,926,183	1,889,722	2,090,423
Wales	169,751	168,014	163,613	152,425	154,444
Scotland	251,822	251,915	246,117	245,840	264,834
Great Britain	2,385,783	2,316,332	2,335,913	2,287,987	2,509,701
Oats.					
England	1,454,144	1,442,075	1,419,128	1,356,739	1,421,951
Wales	253,672	256,074	244,893	235,621	237,170
Scotland	1,007,891	1,007,688	1,012,206	1,004,024	1,004,888
[illegible]	2,715,707	2,705,837	2,676,227	2,596,384	2,664,009
Potatoes.					
England	391,531	339,056	309,419	314,571	320,477
Wales	51,853	48,417	44,936	45,379	44,505
Scotland	184,307	176,615	160,327	160,480	157,671
Great Britain	627,691	564,088	514,682	520,430	522,653
Turnips and Swedes.					
England	1,592,933	1,512,496	1,540,307	1,560,857	1,569,049
Wales	69,833	69,185	70,821	70,843	70,326
Scotland	500,978	561,826	510,780	501,636	503,323
Great Britain	2,163,744	2,083,507	2,121,908	2,133,336	2,142,698
Clover, &c., under Rotation.					
England	2,694,370	2,822,392	2,678,311	2,618,655	2,608,106
Wales	375,086	370,850	360,555	365,078	360,596
Scotland	1,299,992	1,320,209	1,327,952	1,357,009	1,385,369
Great Britain	4,369,448	4,513,451	4,366,818	4,340,742	4,354,071
LIVE STOCK.					
Cattle.	Number.	Number.	Number.	Number.	Number.
England	3,671,064	3,901,663	4,173,635	4,305,440	4,218,470
Wales	596,588	602,738	642,857	665,105	651,274
Scotland	1,070,107	1,120,593	1,148,057	1,154,846	1,143,080
Great Britain	5,337,759	5,624,994	5,964,549	6,125,491	6,012,824
Sheep.					
England	17,530,407	17,912,904	19,169,851	19,859,758	19,114,634
Wales	2,706,415	2,867,144	2,966,862	3,064,696	2,951,810
Scotland	6,882,747	7,141,459	7,290,922	7,389,487	7,100,994
Great Britain	27,119,569	27,921,507	29,427,635	30,313,941	29,167,438
*Pigs.**					
England	2,078,504	2,347,512	2,141,417	2,058,781	1,875,357
Wales	225,456	238,317	211,174	213,754	203,348
Scotland	195,642	185,920	147,668	150,297	151,213
Great Britain	2,499,602	2,771,749	2,500,259	2,422,832	2,229,918

* Exclusive of those kept in towns and by Cottagers with less than ¼ of an acre of land.

APPENDIX (A.)

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 3D FEBRUARY 1875.

Present—Sir Alexander Jardine of Applegarth, Bart.; Sir Henry J. Seton Steuart of Touch, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Mr Erskine of Cardross; Mr Findlay of Easterhill; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Howatson of Dornel; Mr Hunter of Thurston; Mr Irvine of Drum; Mr Small Keir of Kindrogan; Mr Mackenzie of Portmore; Mr Kenneth Mackenzie, C.A.; Mr Munro, Fairnington; Mr David Stevenson, C.E.; Mr Swinton, Holyn Bank; Mr Pettigrew Wilson of Polquhairn; Professor Wilson—Mr SMALL KEIR of Kindrogan in the Chair. Mr F. N. MENZIES reported apologies for the absence of the Hon. G. R. Vernon; Sir Thomas Buchan Hepburn, Bart.; Mr Finlay of Springhill; Mr Glennie, Fernyflatt; Mr Harvey, Whittingham Mains; Mr Hutchison of Carlowrie; Mr Johnstone of Bodesbeck; Mr Martin, yr. of Auchendennan; Mr Murray of Dollerie; Mr Somervell of Sorn; Mr Stewart of Ingliston; and Mr Walker of Bowland.

INVERNESS SHOW, 1874.—Letters were submitted from Sir Kenneth Mackenzie, Mr Loch, convener of the county of Sutherland; and from Mr Mitchell, secretary of the North and West of Sutherland Farmers' Club, acknowledging the votes of thanks passed at last General Meeting.

A silver medal was awarded to Mr John Richardson, Carlisle, for his grass seed dressing machine, which chaffs and riddles at the same time.

CHEMICAL DEPARTMENT.—The remit from the General Meeting in regard to the chemical department was referred to the following committee:—Sir Thomas Buchan Hepburn of Smeaton, Bart., convener; Mr Swinton, Holyn Bank; Mr Pettigrew Wilson of Polquhairn, Mr Mackenzie of Portmore, Mr Milne Home of Wedderburn, Mr Gibson, Woolmet; Mr Walker of Bowland, and Mr Munro, Fairnington.

GENERAL SHOWS.—*Selection of Judges.*—The motion by Mr Barclay, M.P., at the last General Meeting, which was then remitted to the Directors for consideration, with the view of being laid before the next General Meeting, was by them referred to the General Show Committee. The motion was in the following terms:—"That the Directors be recommended, for the purpose of ascertaining who are considered best qualified to act as judges at the Society's Show, to forward to each exhibitor a list of the exhibitors in the group of classes to be judged by one set of judges, and in which he is an exhibitor, and invite him to submit, for the information of the Directors, the names of the three gentlemen (not themselves exhibitors in the group) whom he considers best qualified to act as judges for that group."

Showyard Management.—Certain suggestions by Mr Harris, Earnhill, in regard to some alterations in the details of the Showyard Management, were read to the Board, and remitted to the General Show Committee.

STEAM CULTIVATION.—In terms of the remit from the General Meeting, the Special Committee on Steam Cultivation was added to the list of the Standing Committees of the Society.

MEETING OF DIRECTORS, 3D MARCH 1875.

Present—Sir Alexander Jardine of Applegarth, Bart.; Sir Henry J. Seton Steuart of Touch, Bart.; Sir Thomas Buchan Hepburn of Smeaton, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Mr Graham Binny, W.S.; Mr Finlay of Springhill; Mr Glennie, Fernyflatt; Mr Milne Home of Wedderburn; Mr Hunter of Thurston; Mr Hutchison of Carlowrie; Mr Small Keir of Kindrogan; Mr Martin, yr. of Auchendennan; Mr Munro, Fairnington; Mr Scot Skirving, Edinburgh; Mr David Stevenson, C.E.; Captain Tod of Howden; Mr Pettigrew Wilson of Polquhairn; Professor Wilson—Mr SMALL KEIR of Kindrogan in the

Chair. Mr F. N. MENZIES reported apologies for the absence of the Hon. G. R. Vernon, Mr Findlay of Easterhill, Mr Gillon of Wallhouse, Mr Harvey, Whittingham Mains; Mr Howatson of Dornell, Mr Irvine of Drum, Mr Johnstone of Bodesbeck, Mr Swinton, Holyn Bank; and Mr Walker of Bowland.

ARGYLL NAVAL FUND.—On the recommendation of the Committee in charge of the Argyll Naval Fund, of which Admiral Sir William J. Hope Johnstone, K.C.B., is chairman, Mr Norman Godfrey Macalister was added to the list of recipients, in place of Mr Samuel Ewing, who has been promoted to the rank of lieutenant. Mr Macalister is a native of Argyllshire, and is at present serving in the Britannia.

GENERAL SHOWS.—The minute of the Committee on General Shows, 17th February, was submitted. Among the subjects under consideration were:—

The Selection of Judges.—This subject arose, on the motion of Mr Barclay, M.P., at the last General Meeting, in regard to the nomination of judges of stock. The motion was in the following terms:—"That the Directors be recommended, for the purpose of ascertaining who are considered best qualified to act as judges at the Society's Shows, to forward to each exhibitor a list of the exhibitors in the group of classes to be judged by one set of judges, and in which he is an exhibitor, and invite him to submit for the information of the Directors the names of the three gentlemen (not themselves exhibitors in the group) whom he considers best qualified to act as judges for that group." The motion not being lodged within the time prescribed by the bye-laws, could not be submitted for immediate decision to the General Meeting, and was, on the suggestion of Mr Barclay, remitted to the Directors, and by them referred to the General Show Committee. The minute bears that the Committee, having given the subject their most careful consideration, have to report that, as at present every member is at liberty to send in the names of gentlemen they deem qualified to act as judges, they consider the proposal unnecessary and inexpedient. The Committee are further of opinion that the appointment of the judges should rest entirely with the Directors, and that the less exhibitors have to do with their selection the better.

The Period for Selecting Judges.—The Committee then took into consideration a suggestion previously made by the Secretary on this subject, when they resolved to recommend—(1.) That the judges should be appointed before the entries close. (2.) That it should be remitted to the General Show Committee to draw up a list of judges—say six for each breed—for the consideration of the Directors. (3.) That for this purpose the Committee should meet in May, and have the list ready for the Directors' meeting on the first Wednesday of June.

The Board approved of the recommendations by the Committee, both as to the mode and period of selecting judges.

STEAM CULTIVATION.—The following motion by the Hon. GEORGE WALDEGRAVE LESLIE, approved of at last General Meeting, was remitted for the consideration of the Committee on Steam Cultivation.—"That it be remitted to the Directors for consideration whether it will not be desirable forthwith to appoint a Standing Steam Committee, who shall receive reports from those members of the Society who employ steam cultivation—the said Committee also to recommend rewards or medals as encouragements for decided improvements in the method or cheapness of using steam-power for cultivation."

Mr GLENNIE, Fernyflatt, moved—"That this Board, recognising the importance of steam cultivation in the husbandry of Scotland, resolves to offer premiums to the amount of L.100 for its encouragement, and remits to the Steam Cultivation Committee to frame the conditions under which the premiums are to be awarded."

Mr MILNE HOME seconded the motion, which, after some discussion, was referred to the Committee on Steam Cultivation, without the Board expressing any opinion.

AGRICULTURAL AND FORESTRY DEPARTMENTS.—The SECRETARY intimated that the examinations for the Society's agricultural certificate and diploma, and for the Society's certificates in forestry, had been fixed for Tuesday and Wednesday, the 23d and 24th current, candidates being required to lodge intimation on or before the 15th, with the Secretary, from whom a syllabus of the examination may be obtained.

VETERINARY DEPARTMENT.—The annual public examinations for the Society's veterinary certificate, which are open to the students of any veterinary teacher duly recognised by Government, were fixed to be held on Tuesday and Wednesday, the 13th and 14th April—the practical examination taking place on Monday the 12th.

HUMANITY TO ANIMALS.—The SECRETARY laid before the Directors a copy of a report by a Sub-Committee of Greenock (Burgh) School Board, prepared in compliance with suggestions from the Highland Society, and various associations in the kingdom, having for their object the prevention of cruelty to animals, and the destruction of property, so prevalent among children. The Sub-Committee were of opinion that it would be advisable that the School Board should issue an address to the teachers in the public schools, recommending them to give special instructions, at stated intervals, on the subject; that placards containing appropriate instructions, and suitable mottoes or sentences, should be printed and hung up in the class-rooms, corridors, and play-

grounds. The Sub-Committee appended an address such as might be sent to the teachers, and a few sentences and instructions, as specimens of what it considered suitable for the purpose of inculcating humanity and respect to property.

POLLED HERD-BOOK.—The SECRETARY submitted the third volume o the Polled Herd-Book, containing pedigrees of animals of the polled Aberdeen, Angus, and Galloway breeds, presented to the Society by Mr Alexander Ramsay, Banff, for which the Secretary was instructed to thank the donor.

MEETING OF DIRECTORS, 7TH APRIL 1875.

Present—Sir Alexander Jardine of Applegarth, Bart.; Sir Thomas Buchan Hepbur of Smeaton, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.; Admiral Sir W. J. Hope Johnstone, K.C.B.; Mr Graham Binny, W.S.; Mr Dove, Crosshall; Mr Findlay of Springhill, Mr Milne Home of Wedderburn, Mr Hunter of Thurston, Mr Hutchison of Carlowrie; Mr Johnstone of Bodesbeck; Mr Small Keir of Kindrogan Mr Kenneth Mackenzie, C.A.; Mr Martin, yr. of Auchendennan; Mr Murray of Dollerie; Mr Monteith, Liberton Tower Mains; Mr Scot Skirving, Edinburgh; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Walker of Bowland; Professor Wilson, Mr Pettigrew Wilson of Polquhairn—Mr Small Keir of Kindrogan in the chair. Mr F. N. MENZIES reported apologies for the absence of the Hon. G. R. Vernon, Sir Henry J. Seton Steuart, Bart.; Mr Harvey, Whittingham Mains; Mr Howatson of Dornel, Mr Hozier of Mauldslie Castle; Mr Irvine of Drum; Mr Mackenzie of Portmore; and Mr Munro, Fairnington.

After the reading of the minutes of the meeting of the Board of 3d March, the Secretary reported that he had forwarded to Mr Barclay, M.P., an excerpt from the minutes of the General Show Committee, 17th February, with reference to his motion as to the appointment of judges; and that he had sent to Mr Harris, Earnhill, a copy of the report by the committee of same date on the suggestions made by him in regard to certain alterations in the details of the showyard management. Thereafter a letter, in reply from Mr Harris, was read to the meeting.

CHEMICAL DEPARTMENT.—The report by the special committee appointed to make suggestions to the Directors regarding the Chemical Department was read.

The Board directed it to be printed and circulated among the Directors, previous to being brought up at the meeting to be held on 5th May.

AGRICULTURAL EDUCATION—*Diploma and Certificate.*—The report of the annual examination of candidates for the diploma and certificate in agriculture, which took place on the 23d and 24th March, was submitted, from which it appeared that ten gentlemen presented themselves as candidates, and that the examinations resulted in the following passing:—*For Diploma*—Mr William Kennedy, 89 Marine Parade, Brighton, who obtained the certificate in 1874. *For Certificate and Diploma*—Messrs Thomas Coker Beck, Foleshill, Coventry; George Burn Murdoch, Greenhill Lodge, Edinburgh; and Robert W. E. Murray, Wester Housebyres, Galashiels. *For Certificate*—Messrs John Bramwell, Blackaddie, Sanquhar; George Henry Catt, 44 Middle Street, Brighton; Robert Ewing, reporter, *North British Agriculturist*, Edinburgh; Archibald A. Ferguson, Gosfield, Essex; and John Scott, Howford, Selkirk,—who are entitled to present themselves for the further examination, in terms of the regulations for the Society's diploma. *Prizes in Agricultural Class*—It was announced that Professor Wilson had awarded the two prizes of L.6 and L.4, given by the Society to the Class of Agriculture in the Edinburgh University to Mr A. Ferguson, Gosfield, Essex; and Mr J. I. Brown, Cumberland.

STEAM CULTIVATION.—The minute of the Committee on Steam Cultivation, 31st March, was read. The report stated that the meeting had been held, in terms of a remit from the Directors of 3d March, to consider (1.) that part of the motion by the Hon. George Waldegrave Leslie at the last general meeting relative to the committee receiving reports from those members of the Society who employ steam cultivation, and recommending rewards or medals as encouragements for decided improvements in the method or cheapness of using steam-power for cultivation; and (2.) the motion by Mr Glennie, Fernyflatt, at the last meeting of the Board, recommending the Directors to offer premiums for the encouragement of steam cultivation in Scotland. The minute narrates that the committee took up both remits, and having carefully considered the same, reported that they are not prepared to recommend that the Society should offer premiums; but they are of opinion that the Directors might intimate that they are willing to receive from farmers, and others employing steam-power in the cultivation of the soil, reports on decided improvements on the method of using steam-power, or for any suggestions whereby the expense of steam-power can be reduced. Should these reports be considered of sufficient merit the writers might be rewarded. The Board approved of this report.

VETERINARY EXAMINATIONS.—The SECRETARY intimated that the annual public

examination of candidates for the Society's veterinary certificate was fixed to be held in the Society's hall on Tuesday and Wednesday, the 13th and 14th April, between the hours of ten and four; and that the practical examination would be held in Mr Buist's Auction Mart, Lauriston, on Monday the 12th, at ten A.M.—candidates being required to enter their names with the Secretary on or before the 8th April.

ORDNANCE SURVEY.—The draft of a memorial to the Lords of the Treasury on the completion of the survey of Scotland was approved of.

GLASGOW SHOW, 1875.—Letters to the conveners of the counties connected with the show, and to the Lord Provost of Glasgow, as to the nomination of the Local Committee, were submitted and approved.

ABERDEEN SHOW, 1876.—The Board approved of letters being addressed to the conveners of the counties, in the district of the show, in regard to the auxiliary subscription.

INTERNATIONAL EXHIBITION AT PHILADELPHIA.—The SECRETARY submitted a communication from the Executive Commissioner for the International Exhibition to be held at Philadelphia in 1876, transmitting a letter from the Duke of Richmond, the Lord President of the Council, to His Royal Highness the Prince of Wales as president of the Highland and Agricultural Society, relative to the above-mentioned Exhibition, along with the general regulations for exhibitors issued by the United States Centennial Commission.

The SECRETARY was instructed to forward the letter to his Royal Highness, and to inform him that due publicity would be given to the proposed Exhibition.

The following is a brief summary of the conditions upon which the Exhibition will be conducted:—Her Majesty's Government having accepted the invitation of the President of the United States to take part in this international exhibition, have placed the British section under the Lords of the Committee of Council on Education, and the Lord President of the Council has appointed Mr Philip Cunliffe Owen, C.B., Executive Commissioner. While the Executive will do all in its power generally to assist and advise British exhibitors, it will be understood by exhibitors that, in accordance with the precedents of previous international exhibitions, they or their agents must be responsible for the packing, forwarding, unpacking, and reception of their goods, as well as for their safety during the continuance of the Exhibition. The salient points of the general regulations affecting foreign exhibitors, and the special regulations governing the free importations of exhibits, as determined by the Centennial Commission, are, so far as at present decided, as follows:—1. The Exhibition will open at Philadelphia on the 10th May, and close on the 10th November 1876. 2. Before 1st May 1875, the British Executive must state whether the space allotted is sufficient or deficient, and should therefore receive the demands from proposing exhibitors before 25th April 1875. 3. Before 1st December 1875 the Executive must send in plans in detail, showing individual allotments, with all catalogue information. 4. No charge for space. The British agricultural sections have been placed under the superintendence of Mr Brandreth Gibbs, Half-Moon Street, Piccadilly, London.

HORTICULTURAL EXHIBITION AT AMSTERDAM.—The SECRETARY submitted bulletin No. 1 of an International Horticultural Exhibition, to be held in 1876 at Amsterdam, by the Commission for Regulating National and International Horticultural Exhibitions, in conjunction with the existing horticultural societies and similar associations and establishments in that country.

THE FAMILY OF THE LATE MR REID, GRANTON LODGE.—An application was made to the Board on behalf of Mrs Reid, Granton Lodge, whose late husband was well known to many members of the Society as a wool broker at Granton and Berwick-on-Tweed, the inventor of Reid's cattle truck, and the author of a useful little book on the sheep, and who has died, leaving a widow and four children in very reduced circumstances. The Directors having taken the case into consideration, deem it well worthy the sympathy of the Members of the Society and of all interested in the conveyance of stock, and authorise the Secretary, with their full approval, to collect subscriptions.

MEETING OF DIRECTORS, 5TH MAY 1875.

Present—The Hon. G. R. Vernon, Auchans House; Sir Robert J. Milliken Napier of Milliken, Bart.; Sir Alexander Jardine of Applegarth, Bart.; Sir Thomas Buchan Hepburn of Smeaton, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Mr Graham Binny, W.S.; Mr Findlay of Easterhill; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Howatson of Dornel; Mr Hunter of Thurston; Mr Hutchison of Carlowrie; Colonel Innes of Learney; Mr Johnstone of Bodesbeck; Mr Small Keir of Kindrogan; Mr Kenneth Mackenzie, C.A.; Mr Munro, Fairnington; Mr Murray of Dollerie; Mr Scot Skirving, Edinburgh; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Walker of Bowland; and Professor Wilson—Mr SMALL KEIR of Kindrogan in the chair. Mr F. N.

Menzies reported apologies for the absence of Sir Henry J. Seton Steuart of Touch, Bart.; Mr Glennie, Fernyflatt; Mr Harvey, Whittingham Mains; Mr Irvine of Drum; Mr Martin, yr. of Auchendennan; Mr Graham Somervell of Sorn; and Mr Pettigrew Wilson of Polquhairn.

General Meeting.—The half-yearly general meeting of the Society, for the election of members and for other business, was fixed to be held on the 16th June, being the first Wednesday after the closing of the entries for the Glasgow Show, and the usual day for holding the meeting.

Chemical Department—Resignation of Professor Dewar.—The Secretary read the following letter from Mr Dewar:—

"Cambridge, St Peter's College,
16*th April* 1875.

"My Dear Sir,—I am truly sorry to inform you that on account of my appointment to the Jacksonian Chair in the University of Cambridge, our friendly intercourse as officials of the Highland and Agricultural Society must terminate at the next November term. After what has occurred, it will hardly be necessary for me to say anything about what might have been had the chemical department been rearranged in the way I naturally anticipated after the death of Dr Anderson. You are aware I intended prosecuting investigations in vegetable physiology, had the proper means been placed at my disposal; and the desire to do so was the main reason of my leaving the University. As it seems, however, the opinion of a portion of the Society that an agricultural chemist (so called by the uninitiated, because his business is chemical analyses and the manipulating of the farming interests) rather than a scientific chemist, would be best qualified to discharge the duties of the office of chemist, I have considered it my duty to accept the Cambridge Professorship as the best means of getting out of a false position. I still trust, however, the Society will ultimately see that this office of chemist will never be properly filled except by one thoroughly trained in scientific research, and this, the making him a real agricultural chemist, will depend on the means placed at his disposal for applying his scientific knowledge to agriculture. I take this opportunity of conveying to you my heartfelt thanks for the great interest you have taken in my welfare since I became connected with the Society.

"Kindly inform the Directors of my appointment.—Yours very truly,

(Signed) "James Dewar.

"Fletcher Norton Menzies, Esq."

The following resolution was unanimously adopted:—"The Directors cannot accept Professor Dewar's resignation of the office of assistant chemist without recording in their minutes their sense of the value of his services, and their regret at the loss to the Society of such a distinguished chemist. At the same time, they congratulate him on having been appointed to such an honourable position."

Report by Special Committee.—This report, which was submitted to the meeting of the Board on the 7th of April, when it was directed to be printed and circulated among the Directors, previous to being brought up at the meeting held to-day, will be found in the proceedings of the general meeting for June.

After various explanations had been asked and given in reference to details, it was moved by Sir Thomas Buchan Hepburn, and seconded by Mr Scot Skirving:—"That the Chemical Department of the Highland Society be constituted on a scale suited to the funds at their disposal, and that a chemist be appointed, in terms of the special meeting of Board of 9th December 1874, to superintend and conduct the same, and experimental stations, as stated in the report of the special committee, appointed on the 3d of February 1875."

Mr Milne Home of Wedderburn moved as an amendment:—"That the report of the special committee be approved of in every respect, except the recommendation to appoint a chemist to institute investigations on all subjects relating to agriculture, at a salary of L.300, and with power to work also for the general public, reserving for future consideration the expediency of appointing a chemist at a much lower salary to assist in the management of the Society's experimental stations, and who shall give his whole time to the service of the Society. Farther, the Directors are of opinion that a deputation should go at once to London to endeavour to obtain from the Government a promise of a grant to assist in establishing the experimental stations referred to in the Society's memorial to Government, the deputation keeping in view the instructions drawn up for their guidance framed by the special committee, and with power to any of the members of the deputation to visit Rothamstead before their interview with Government."

The amendment by Mr Milne Home not being seconded, the motion by Sir Thomas Buchan Hepburn was carried. It was referred to the special committee, with the assistance of Professor Dewar, to prepare a statement for the general meeting in accordance with their report. The deputation to the Government was postponed till after the general meeting on the 16th June.

Glasgow Show, 1875.—A letter was submitted from Mr W. Alston Dykes, clerk of supply, Hamilton, sending L.899, 0s. 5d., the amount of the voluntary contribution by the county of Lanark in aid of the auxiliary fund.

Aberdeen Show, 1876.—A letter was submitted from the county clerk for Banffshire intimating that the Commissioners of Supply had, at their annual meeting, resolved to raise a fund to assist in meeting the expense by a voluntary assessment.

Veterinary Department.—The report of the examinations for the Society's veterinary certificate on the 12th, 13th, and 14th April was laid on the table, from which it appeared that 40 students presented themselves for examination, and that 32 passed. The two medium gold medals given to the students who passed the best practical and best general examination were awarded as follows:—*Best Practical Examination*—William W. McGwire, Dublin. *Best General Examination*—Israel Print, Wolford, Warwickshire.

Captain Tod of Howden, chairman of the Society's Veterinary Department, said,—I wish to make a short explanation with reference to my remarks at the close of these examinations relative to the students of the New College not being admitted to the slaughter-houses. Mr Harris, depute town-clerk, very courteously sent me a copy of a short correspondence (which I have handed to our secretary), from which it appears that the Town Council had not officially refused admittance. The impression arose from some members of the Town Council recommending Principal Williams not to forward an application when he consulted them as to the propriety of doing so. My object in making the statement was to obtain equal privileges for all veterinary students, which I hope the municipal authorities will now give.

Subscription for Mrs Reid and Family.—Mr Menzies reported that the subscription on behalf of the family of the late Mr William Reid, Granton and Berwick, was progressing favourably, but that he had not received anything from those who were not members of the Society, and he feared it was not known that he would accept subscriptions from the public.

MEETING OF DIRECTORS, 2d JUNE 1875.

Present—The Hon. Greville R. Vernon, Auchans House; Sir Thomas Buchan Hepburn of Smeaton, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Mr Graham Binny, W.S.; Mr Dove, Crosshall; Mr Findlay of Springhill; Mr Gibson, Woolmet; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Hunter of Thurston; Mr Small Keir of Kindrogan; Mr Mackenzie of Portmore; Mr Scot Skirving, Edinburgh; Mr Graham Somervell of Sorn; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Pettigrew Wilson of Polquhairn.—Mr Small Keir of Kindrogan in the chair. Mr F. N. Menzies reported apologies for the absence of Messrs Harvey, Whittingham Mains; Howatson of Dornel; Hutchison of Carlowrie; G. Auldjo Jamieson, C.A.; Johnstone of Bodesbeck; Colonel Innes of Learney; Messrs Irvine of Drum; Kenneth Mackenzie, C.A.; Munro Fairnington; Murray of Dollerie; Walker of Bowland, and Professor Wilson.

General Meeting.—The programme of business for the half-yearly general meeting on the 16th current, was arranged as follows:—Election of Members; Arrangements for Glasgow Show 1875, and Aberdeen Show 1876; Motion by Mr Barclay, M.P., in regard to the selection of judges; Agricultural Education:—Report of Examinations—bye-laws; Chemical Department:—Report by Directors, and Resignation of Professor Dewar—report by Professor Dewar; Motion by Colonel Innes of Learny: Report of Veterinary Examinations; Volume VII. of Society's Transactions—Memorial to the Treasury on Ordnance Survey—Steam cultivation.

New Members.—The list of condidates for election at the general meeting was submitted; and the Secretary stated that he could, in terms of the bye-laws, receive additional names up to the morning of the 16th.

Chemical Department.—The minute of the committee appointed to draw up a Report on the Chemical Department to be submitted to the general meeting was read, and, after some discussion, was approved—Mr Milne Home of Wedderburn entering his dissent specially in reference to the appointment of a chemist.

A letter was read from Dr Lindsay, Dollar, sending excerpt from minutes of the trustees of Dollar Institution proposing a meeting with a committee of the directors in reference to a garden attached to Dollar Institution, which it is proposed to use as an experimental agricultural station.

Mr Milne Home of Wedderburn, Mr Scot Skirving, and Mr Swinton, Holyn Bank, were named a committee to meet with the Dollar committee.

Glasgow Show.—*Auxiliary Subscription.*—Letters were reported from the Clerks of Supply for the counties of Ayr and Bute, sending the amount of the voluntary assessment in these counties.

Closing of the Entries.—The Secretary stated that he was to attend at the Queen's Hotel, Glasgow, on Wednesday the 9th current, to receive entries and close the list.

HUMANITY TO ANIMALS.—The Secretary, in submitting the humanity series of school-books for national and other schools, edited by the Rev. F. O. Morris, rector of Nunburnholme, Yorkshire, stated that the books, six in number, were composed of short pieces, prose and poetry, for reading in schools, and that great credit was due to Mr Morris for the judicious manner in which the various lessons had been selected and arranged. Mr Morris had certainly supplied a want which had long been felt in school-books. Mr Menzies had therefore great pleasure in calling attention to the works, with the view of getting them introduced into schools, as they were admirably calculated to foster in children humanity and kindness towards animals.

MEETING OF DIRECTORS, 16TH JUNE 1875.

Present—Sir Thomas Buchan Hepburn of Smeaton, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Mr Dove, Crosshall; Mr Graham Binny, W.S.; Mr Findlay of Easterhill; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Hunter of Thurston; Colonel Innes of Learney; Mr Irvine of Drum; Mr Johnstone of Bodesbeck; Mr Small Keir of Kindrogan; Mr Mackenzie of Portmore; Mr Kenneth Mackenzie, C.A.; Mr Martin, Yr of Auchendennan; Mr Munro, Fairnington; Mr Scot Skirving, Edinburgh; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Walker of Bowland; Mr Pettigrew Wilson of Polquhairn; Professor Wilson—Mr SMALL KEIR in the chair. Mr F. N. MENZIES reported apologies for the absence of the Hon. G. R. Vernon; Sir Alexander Jardine, Bart.; Sir George Macpherson Grant Bart.; and Mr Howatson of Dornel.

The business had reference principally to the subjects to be brought before the general meeting of this date.

MEETING OF DIRECTORS, 20TH OCTOBER 1875.

Present—Sir William Stirling-Maxwell of Keir, Bart., M.P.; Sir Henry J. Seton Stuart of Allanton, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Professor Balfour; Mr Graham Binny, W.S.; Mr Erskine of Cardross; Mr Howatson of Dornel; Mr Hunter of Thurston; Mr Irvine of Drum; Mr Small Keir of Kindrogan, Mr Kenneth Mackenzie, C.A.; Mr Swinton, Holyn Bank; Captain Tod of Howden; Professor Wilson; Mr Pettigrew Wilson of Polquhairn.—Mr SMALL KEIR of Kindrogan in the chair. Mr F. N. MENZIES reported apologies for the absence of Sir George Macpherson Grant of Ballindalloch, Bart.; Mr Milne Home of Wedderburn; Mr Johnstone of Bodesbeck, and Mr Walker of Bowland.

AGRICULTURAL EDUCATION.—The examinations for the Society's bursaries (ten of £20 and five of £10) were fixed to be held in the Society's hall on Tuesday the 16th November. It was arranged that candidates should be examined in the Elements of Chemistry and of the following branches of natural science: Physical Geography, Botany, and Geology; and that they must enter their names with the Secretary on or before Tuesday the 2d November, and produce the necessary certificates from the teachers of the schools they have attended. There was no other business before the meeting.

MEETING OF DIRECTORS, 3D NOVEMBER 1875.

Present:—Sir Alexander Jardine of Applegarth, Bart.; Sir Thomas Buchan Hepburn of Smeaton, Bart.; Mr Dove, Crosshall; Mr Erskine of Cardross; Mr Gibson, Woolmet; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Hunter of Thurston; Colonel Innes of Learney; Mr Small Keir of Kindrogan; Mr Kenneth Mackenzie, C.A.; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Walker of Bowland; Professor Wilson; Mr Pettigrew Wilson of Polquhairn. Mr SMALL KEIR of Kindrogan in the Chair. Mr F. N. MENZIES reported apologies for the absence of Sir Thomas Miles Riddell, Bart.; Sir Henry Seton Steuart, Bart.; Sir George Macpherson Grant, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Professor Balfour; Mr Dundas of Arniston; Mr Irvine of Drum; Mr Johnstone of Bodesbeck; Mr Martin, yr. of Auchindennan; Mr Munro, Fairnington; Mr Murray of Dollerie; Mr David Stevenson, C.E.; and Mr Campbell Swinton of Kimmerghame.

DEATH OF MR GLENNIE, FERNYFLATT.—Before proceeding to the business on the programme, the Directors instructed the Secretary (1.) to record in the Minutes the deep regret with which they regard the death of Mr Arthur Glennie, Fairnyflatt, one

of their number, and to express their sense of the valuable assistance which the Society had received from him as a judge of stock and Director of the Society; (2.) to send a copy of this resolution to Mrs Glennie, with their respectful sympathy.

CHEMICAL DEPARTMENT.—The following letter from Mr Roughead was read:—

"HADDINGTON, 28*th June* 1875.

"SIR,—I regretted not getting an opportunity of expressing at the meeting of the Society, held on the 16th, my ideas as to the appointing of a chemist. I am satisfied, in order to give entire confidence, and I have the approval of the members of the Society, especially farmers,—we must have a chemist devoting his whole time to the work of the Society. A young man of ability, and a master of his profession, could be obtained for £400 to £500 per year, with the expectation of an increase. To raise this sum, I would have each parcel of manure and seeds wished to be analysed by members sent to your office, along with the fee fixed by the directors, which ought to be a small one, in order to induce farmers to have all their purchases tested, and the chemist, after recording the result, send a copy thereof to the member who has duly remitted the fees. A certain number of pupils should be taken into the laboratory at a fixed fee, also to be paid into your office. A separate account to be kept for all fees received, out of which fund the salary of the chemist will be paid. I feel certain, in a very short time this fund will be able to meet salaries and expense of the laboratory without encroaching upon the funds of the Society. The pupils would assist (under the direction of the chemist) in preparing the tests; but it must be his duty personally to weigh the different component parts of the samples sent to be analysed. Regarding the experimental farm—before establishing the same, I would advise that a small deputation, composed of directors and practical agriculturists, ought to visit one or two of the like establishments in Germany. I have visited some of these myself, and been much delighted with the arrangements and with the amount of information imparted to the students attending at each of the stations. The station I was most pleased with was that in the neighbourhood of Griefswald, in connection with the university there. The farm is a large one—I think about 1000 acres, with about 100 acres devoted to experiments in testing different plants and grain with different kinds of manures. I could send you a copy of reports (in German) I brought with me last year. Griefswald is near Stettin, and can be got at in a short time and at little expense. I shall be glad to give you any further information in my power. May I ask the favour of your placing this letter before your directors, and I shall be glad to know what has been done.—I remain your most obedient servant,

(Signed) "DAVID ROUGHEAD.

"F. N. MENZIES, Esq.

The Secretary was instructed to inform Mr Roughead that his letter would be taken into consideration in the report to be brought up to the general meeting.

LORD CALTHORPE'S SCHEME.—The resolution passed at last general meeting referring it to the Directors to consider the propriety of granting a sum of a L.100 for five years to the fund proposed to be raised by Lord Calthorpe for improving and maintaining a proper supply of horses in Scotland, was brought before the meeting, when, after some discussion, the Secretary was instructed to obtain further information on the subject before the next meeting of the Board.

AGRICULTURAL EXPERIMENTAL STATIONS.—The motion by Colonel Innes of Learney on this subject at the general meeting in June last was under the consideration of the meeting, and after some discussion the Secretary was instructed to obtain information in regard to the agricultural experimental stations formed in Aberdeenshire and other counties in the north.

AGRICULTURAL EDUCATION—*Bursaries.*—The Secretary stated that the examinations for the Society's bursaries had been fixed to be held on Tuesday the 16th current, but that only one candidate had offered himself for examination. *Committee.*—The following were named as a standing acting committee of the Council, in terms of the new bye-laws:—The Lord Justice-General, the Professor of Agriculture, the Professor of Botany, the Professor of Chemistry, Mr Hope of Borlands, Mr Mylne, Niddry Mains, and Mr Hunter of Thurston: three a quorum. The Lord Justice-General, Convener.

ORDNANCE SURVEY.—The Secretary reported that, pursuant to the instructions from the last general meeting, a deputation from the Society waited upon Lord Henry Lennox, M.P., the First Commissioner of Works, at the House of Commons, for the purpose of presenting a memorial and asking for a Government grant to complete the unfinished survey of Scotland. Among those forming the deputation were—The Earl of Galloway, Lord Elphinstone, Sir Graham Montgomery, Bart., M.P.; Sir James Elphinstone, Bart., M.P.; Sir H. Davie, Bart., M.P.; Mr Baillie Cochrane, M.P.; Mr Charles Dalrymple, M.P.; Mr R. W. Duff, M.P.; Mr Orr Ewing, M.P.; Mr Fraser Mackintosh, M.P.; Mr Malcolm, M.P.; Mr John Ramsay, M.P.; Mr Mark Stewart, M.P.; Mr Dundas of Arniston, Mr Erskine of Cardross, Mr Watson Lyall, and Mr F. N. Menzies, Secretary. After the reading of the Memorial and some remarks by Mr

Dundas, Mr Malcolm, and Mr Ramsay, the First Commissioner said the subject of the memorial would have his best attention.

The following letter from the Secretary to the Commissioners of Her Majesty's Works was then read:—

"H.M. Office of Works, &c., S.W.,
2*d July* 1875.

"Sir,—I am directed by the First Commissioner of Her Majesty's Works, &c., to acquaint you, on behalf of the Highland and Agricultural Society of Scotland, that his Lordship has duly considered the memorial which was presented to him by a deputation from the Society on the 22d ult. in regard to the survey of Scotland.

"I am to state that the First Commissioner fully recognises the advantage which would be derived from the replotting on the 1-2500 scale of such of the counties of Scotland as have been surveyed on the 6-inch scale only.

"I am, however, to remind you that the survey of the counties of York and Lancaster is in a precisely similar position, and that, in the face of the pressing demands upon him from all parts of the kingdom, which have not yet been surveyed, it seems to the First Commissioner impracticable to comply with the request of the memorialists.

"The cost of replotting the counties in Scotland referred to, containing an area of 3230 square miles, is estimated at £51,680; and for the reasons already stated, the First Commissioner would not feel justified in appropriating to that object at present any portion of the ordinary grant for the surveys of the United Kingdom.

"The Lords Commissioners of her Majesty's Treasury are averse to sanctioning any special addition to the vote for the purpose in question, inasmuch as Yorkshire and Lancashire, containing an area of 7828 square miles, have an equally strong claim to be replotted; and their Lordships could hardly consent to an addition to the vote in respect of Scotland without making a corresponding, or even still larger, addition in respect of the greater area included in the two English counties. Under these circumstances, the First Commissioner regrets that he is unable to depart from the decision arrived at in the matter by his predecessor. He desires me, however, to invite the attention of the Highland Society to the fact already stated, that the survey of Scotland is conducted in no exceptional manner. It is being carried on under precisely the same orders and regulations as the survey of the other parts of Great Britain, and there has been no interruption to the publication of the plans of Scotland.—I am, Sir, your obedient servant, (Signed) "A. B. Mitford, *Secretary.*

"Patrick S. Keir, Esq.,
Chairman of the Highland and Agricultural Society."

Veterinary Department.—The Secretary reported that the preliminary examination of students for the Society's veterinary certificate took place on the 13th and 14th July, when 32 students entered their names for examination—namely, 13 from the Edinburgh Veterinary College, 16 from the New Veterinary College, Edinburgh, and 3 from the Glasgow Veterinary College,—and that 16 had obtained the certificate.

Inverness Show, 1874.—*Two-Year-Old Galloway Heifers.*—The first and second, premiums, awarded respectively to the Duke of Buccleuch for "Nerio," and Mr Cunningham, Tarbreoch, for "Mary II.," have been forfeited, the animals having failed to produce calves within the specified time. The first premium has been transferred to Mr Cunningham, Tarbreoch, for "Bridesmaid," which stood third.

Mares in Foal.—The first and second premiums, awarded respectively to Mr Murdoch, Hallside, for "Maggie," and to Mr Leitch, Inchstelly, for "Queen," have been forfeited, the animals not having proved in foal. The first premium has been transferred to Mr Montgomery, Boreland, for "Nanny," and the second to Mr Hendrie Castle Heather, for "Dandy."

Glasgow Show, 1875.—*Awards.*—The Directors approved of the awards at the late Show at Glasgow, and the Chairman was authorised to sign orders for the money premiums, which the Secretary was instructed to issue, along with the medals, as early as convenient.

Forage Yard.—A letter was read from the Forage Committee (Messrs David Cress and Thomas Scott), reporting that they frequently visited the forage yard during the show, and found an ample supply of the various articles, all of most excellent quality; and that the deliveries were made as fast as applicants appeared, and all going on without the slightest confusion or complaint. A communication was also read from Sir William Forbes of Craigievar, Bart., stating he thought some special notice should be taken and made public of the admirable manner in which the forage yard was supplied by Mr Buchanan, 391 Parliamentary Road, Glasgow, during the show. Sir William added, that having taken special notice of it, and having done so for several years, he never saw better food, and there was not a single instance of complaint as to the arrangements.

Turnip-Thinning Machines.—The following report of the Local Committee was

read:—"In accordance with the resolution of the Local Committee adopted in Glasgow, a trial of the turnip-thinning machines exhibited at Glasgow took place on Friday the 6th instant, on the Home Farm of Craigie, near Ayr. Four machines were tried—namely, No. 1134, exhibited by Messrs R. Bickerton & Sons, Berwick-on-Tweed; No. 1214, exhibited by Mr John Dickie, Girvan; No. 1572, exhibited by Mr Thomas Hunter, Maybole; and No. 1573, also exhibited by Mr Hunter. Two other implement-makers were unable to have their machines on the ground at the time. The turnips were sown after the removal of a crop of early potatoes, and the soil was like a piece of garden ground. It offered, perhaps, too little resistance to the action of the machines. The machines were tried first on a field where the crop was going past the best stage for singling, and afterwards in a field where the plants were scarcely ready for the hoes. In our opinion Mr Hunter's machine, No. 1573, made the best work, and his other machine came next to it. We do not think, however, that they should be placed first and second, as they are substantially the same. The one has slower action than the other, and on that account it worked better on the light soil at Craigie. We would place Mr Hunter first, and Mr Dickie second. There was no great difference in the quality of the work done by the two machines; but any difference was in Mr Hunter's favour, and he has a further advantage in the cheaper machine. We cannot speak very strongly as to the utility of the machines. They may be useful for sending over drills at an early stage of the growth, at times when turnips are coming away rapidly and hands are scarce. The turnips would then be less susceptible of injury from delay in thinning. But the advantage to be gained by using the machines when the crop is ready for singling was not very obvious at the trial.

(Signed) "James Drennan.
"John Young.
"John Murray.

"Ayr, *August 6th*, 1875."

Self-Delivery Reapers.—The following report was read:—"We beg to report that we tried this day a self-delivery reaper, exhibited at the Glasgow show by Walter A. Wood, 36 Worship Street, London, stand No. 67, article No. 767. The reaper was tried in a field of wheat belonging to Mr Gibson, Woolmet. It was a fair crop, and well fitted to test the machine, which, in our opinion, did its work exceedingly well. The principal improvement in this machine is that the rakes are under the control of the driver; it is a very simple arrangement, and not likely to get out of order, being a cord attached to a lever at the driver's foot; it then passes round a small pulley, and the other end of the cord being attached to another lever at the side of the upright shaft of the machine. From the end of this lever a wire passes up in a groove cut in the upright shaft and fixed to another lever on the top of the machine, which acts when required on the rakes as they go round, thereby enabling the driver to make the sheaves small or large at will. There is another improvement in the fixing of the knife, which is done by a spring rod and keeper, avoiding the use of screen bolts, which are very apt to be overhauled. In other respects the machine is the same as was exhibited and tried at Stirling in 1873. The draught of this machine, as tested with the dynamometer, was 2½ cwt. The reaper exhibited by William Anson Wood, 5 Upper Thames Street, London, stand No. 68, article No. 778, was tried, on the 27th and 28th of August, on a field of wheat belonging to Mr Bryden Monteith, Liberton Tower Mains; but after being in operation a few minutes both days, it broke down. He got the opportunity of another trial at Woolmet on the 31st, but he could not get another machine forward in time.

"John Gibson, Woolmet, Dalkeith.
"James D. Park, Engineer.

"Edinburgh, 31*st August* 1875."

The Board awarded a silver medal to Mr Walter A. Wood.

Manure Distributor and Potato Planters.—The following report by the Implement Committee was read:—

"On the 12th of October trials of the above implements were, by the kind permission and assistance of Mr Monteith, made on his farm at Liberton Tower, on a field from which a crop of potatoes had just been lifted, and was in every respect suited for the trials.

"The members of committee present were—Mr Hunter of Thurston, Mr Munro, Fairnington; Mr Swinton, Holyn Bank; Mr David Stevenson, C.E.; and Mr James D. Park, engineer.

"1. *Manure Distributor.*—This machine is the invention of Mr Robert Parker, Culhorn Parks, Stranraer, by whom it has been patented as a combined roller and manure distributor.

"The distributing parts of the machine consist simply of a pair of hoppers or feeding-boxes, in the interior of which two sets of teeth are made to revolve in such a way as to admit of the manure escaping in a perpetual stream from an aperture in the

bottom; the size of which can be regulated. After passing from the hopper the manure is carried by means of spouts or slides to the drills, which in the meantime have been opened up by two double-mould board-ploughs attached to the implement beneath and travelling immediately in front of the slides. In the fore part of the machine are the driving-wheels, as well as appliances for steering and for regulating the depth of the furrow. Drawn by a pair of horses, and attended by two men, the hoppers, having been filled with a couple of cwts. of dissolved bones, the machine was carefully tested; and though it cannot be said that the manure was put into the drills with perfect regularity, and while some exception might be taken to the heaviness of the draught, the implement seemed such as is likely to be really serviceable before long. From one of the hoppers the manure flowed freely and regularly enough, but the delivery from the other was intermittent, apparently owing to some flaw in the working of the teeth; but this, of course, could be easily remedied.

"After careful consideration, the committee are disposed to report favourably of the machine, and to recommend that the Directors should mark their approval by awarding the inventor a silver medal.

"II. *Potato Planters.*—Of the four machines exhibited at Glasgow and recommended for trial, only those belonging to Mr William Dewar, Kellas, Dundee, and Mr Alexander Guthrie, Craigo, Montrose, were brought forward.

"The machine first tried was that of Mr Guthrie, which is worked by a revolving wheel about 2 feet in diameter, furnished with a set of cups, by which the seed is lifted and deposited alternately in one or other of the two drills covered by the planter.

"It is intended that by each cup only one potato should be caught, but at the trial on this occasion as many as three tubers were frequently lifted at a time, causing an objectionable waste of seed. The irregularity of the delivery was increased by the unsteady working of the horse, which had to walk along the crown of the drill.

"In Mr Dewar's machine the seed is taken from the hoppers by a pair of large wheels, round which are arranged, at intervals of 11 inches, a series of catches, worked by spiral springs, and which lift the potatoes from the hopper. The tubers were thrown out into the furrow by a slide in such a way that they became scattered, and in many cases lay together in threes and fours.

"After a careful trial of both machines, the committee are unanimously of opinion that they have not yet reached such perfection as to warrant the Directors in expressing a favourable opinion regarding either of them. Much ingenuity is displayed by both of the exhibitors, but the delivery of the potatoes is so very irregular that in their present state the committee cannot recommend the machines.

(Signed) "James W. Hunter, *Convener.*
" "David Stevenson.
" "John Munro.
" "James D. Park.

"Edinburgh, 12*th October* 1875."

In accordance with the report, the Board awarded a silver medal to Mr Robert Parker.

Aberdeen Show, 1876.—It was remitted to the Committee on General Shows to arrange the premiums and adjust the regulations for the Show to be held at Aberdeen next year; to consider a letter from the Marquis of Tweeddale on the subject of judging the wool of sheep, as well as their symmetry; and a letter from the Rev. U. H. Allen on adding houdans as a class of poultry.

Proposed Show at Edinburgh in 1877.—Requisitions addressed to the Directors to hold the general Show at Edinburgh in 1877, from the counties of Edinburgh, Haddington, and Linlithgow, and the city of Edinburgh, were laid before the meeting, and remitted to the Committee on General Shows to prepare the classes of stock for which premiums should be offered.

Proposed Show at Carlisle in 1877.—The following letter was read:—

"Carlisle, *Oct.* 31*st*, 1875.

"Sir,- At a large and influential meeting recently held in Carlisle, attended by gentlemen interested in agriculture from Cumberland, Westmoreland, Furness, West Northumberland, and the south of Scotland, it was decided to take the necessary steps preliminary to inviting the Royal Agricultural Society of England to hold its country meeting for 1877 at Carlisle.

"It has been suggested that the Highland and Agricultural Society should also be invited to Carlisle to unite with the Royal of England on and for that occasion in making one grand show, with an increased number of augmented prizes, to give an additional stimulus to inventive skill, and the intelligent persevering application thereof.

"Without dwelling upon the superior railway facilities which Carlisle enjoys, it will be obvious that the expense and trouble to exhibitors and the public will be much less, and the advantages to all parties concerned much greater, than could possibly

result from holding the shows separately, while the special objects of both Societies would be promoted in the highest degree.

"It is understood that in any case the Royal will hold its 1877 meeting in the north-western district of England, and the Highland in the southern district of Scotland.

"As the occasions on which these two great Societies hold their shows in such comparative proximity are exceedingly rare, and in all probability the present generation will never have such another opportunity of witnessing so unique a gathering as that proposed, in which the characteristic stocks of the two countries would be ranged side by side, the present is an opportunity which ought not to pass unimproved.

"I will be glad to learn whether the suggested meeting of the two Societies at the old border city of Carlisle commends itself to your approval; and if so, may we look for your support in carrying the movement into effect.—I am, Sir, your obedient servant. (Signed) "JOHN HARGRAVES, Mayor of Carlisle.

"F. N. MENZIES, Esq."

After a prolonged discussion, the Directors unanimously resolved that they did not deem it expedient to concur in the proposal.

SOCIETY'S MODELS IN MUSEUM OF SCIENCE AND ART.—A letter was read from Professor Archer, dated 22d June, intimating that the collection of models of implements and apparatus formed by the Society, supplemented by that collected and presented by the University of Edinburgh, has now been arranged in the upper gallery of the Museum, and is available for public use.

MISCELLANEOUS REMITS.—The following remits were made:—To the Committee on Office-Bearers, to report on vacancies and suggest list for 1876; to the Committee on Essays and Reports, to read and report on papers lodged in 1875, and to revise the list for 1876; to the Committees on District Competitions and on Cottages and Gardens, to revise the awards for 1875 and consider the applications for 1876; to the Special Committee on Entomological Specimens, a letter from Admiral Sir James Hope of Carriden on the Colorado beetle.

DISTRICT SHOWS.—The mare belonging to Mr Hunter, Brownhill, which carried the third premium in the Buchan district in 1874, not having proved in foal, the premium has been transferred to Mr Killoh, Middlethird, whose mare stood fourth.

MEETING OF DIRECTORS, 1ST DECEMBER 1875.

Present—The Hon. G. R. Vernon, Auchans House; Sir Thomas Buchan Hepburn of Smeaton, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.; Professor Balfour; Mr Erskine of Cardross; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Howatson of Dornel; Mr Hunter of Thurston; Mr Hutchison of Carlowrie; Mr Irvine of Drum; Mr Johnstone of Bodesbeck; Mr Small Keir of Kindrogan; Mr Mackenzie of Portmore; Mr Kenneth Mackenzie, C.A.; Mr Martin, yr of Auchindennan; Mr Munro, Fairnington; Mr Murray of Dollerie; Mr David Stevenson, C.E.; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Walker of Bowland; Mr Pettigrew Wilson of Polquhairn; Professor Wilson.—Mr SMALL KEIR of Kindrogan in the chair. Mr F. N. MENZIES reported apologies for the absence of Sir Alexander Jardine of Applegarth, Bart.; Sir Thomas Miles Riddell of Sunart, Bart.; Sir Henry Seton Stenart of Touch, Bart.; Admiral Sir William Hope Johnstone, K.C.B.; Mr Graham Binny, W.S.; Mr Dove, Crosshall; and Mr Campbell Swinton of Kimmerghame.

AGRICULTURAL EXPERIMENTS.—It was remitted to a committee, consisting of Sir Thomas Buchan Hepburn, Bart., convener; Mr Pettigrew Wilson of Polquhairn; Mr Swinton, Holyn Bank; and Mr Walker of Bowland, to draw up a report for the consideration of the next meeting of the Board, with reference to the remit from the general meeting in June on the establishment of agricultural experimental stations.

GENERAL MEETING.—The anniversary general meeting of the Society was fixed for the 19th of January 1876, being the third Wednesday of the month, and the usual day for holding the meeting.

FINANCE.—The Secretary, in submitting a statement of the funds at the close of the financial year on the 30th November, reported that the books and vouchers had of that date been placed in the hands of Mr Kenneth Mackenzie, C.A., the Society's auditor.

OFFICE-BEARERS FOR 1876.—The report by the Committee on Office-Bearers for 1876 was given in, and the Secretary was instructed to communicate with the noblemen and gentlemen suggested to fill the vacancies which occur in January next, before publishing their names.

AGRICULTURAL EDUCATION.—The examination of candidates for the bursaries, recently established by the Society, was held on the 16th November, when Mr Alexander Sutherland, Public School, Gersay, Watten, Golspie, passed for a bursary of L.20. By the regulations Mr Sutherland requires to take the classes in the Edinburgh University necessary to qualify for the Society's certificate or diploma. The

examiners were: Professor Wilson, Professor Balfour, and Dr William Stirling of the Edinburgh University.

General Show.—*Aberdeen Show*, 1876.—At the last meeting of the Board, it was remitted to the Committee on General Shows to consider and arrange the premiums to be offered next year at Aberdeen. The committee held its meeting on the 17th November, and have suggested premiums to the amount of L.2406, being an increase of L.806 over what was offered at Aberdeen in 1868. The list was approved, and will be submitted to a meeting of members to be held in the Imperial Hotel, Aberdeen, on Friday the 17th current at one o'clock.

Edinburgh Show.—The classes for the proposed show at Edinburgh in 1877, as suggested by the Committee on General Shows, were submitted to the Board previous to being laid before a meeting of members to be held in the Society's hall on Wednesday the 15th current, at half-past one o'clock.

District Shows.—The reports by the Committees on District Shows and on Cottages and Gardens, detailing the awards at the various competitions held during 1875, and suggesting the districts for 1876, were submitted and approved.

MEETING OF DIRECTORS, 5TH JANUARY 1876.

Present—Sir Alexander Jardine of Applegarth, Bart.; Mr Graham Binny, W.S.; Mr Dundas of Arniston; Mr Findlay of Springhill; Mr Gibson, Woolmet; Mr Gillon of Wallhouse; Mr Howatson of Dornel; Mr Hunter of Thurston; Mr Hutchison of Carlowrie; Colonel Innes of Learney; Mr Small Keir of Kindrogan; Mr John Ord Mackenzie of Dolphinton; Mr Kenneth Mackenzie, C.A.; Mr Martin, yr. of Auchendennan; Mr Murray of Dollerie; Mr David Stevenson, C.E.; Mr Stewart of Ingliston; Captain Tod of Howden; Mr Walker of Bowland; Mr Pettigrew Wilson of Polquhairn; Professor Wilson; Mr Wilson, Durn. Mr Small Keir of Kindrogan in the chair. Mr F. N. Menzies reported apologies for the absence of Sir Thomas Buchan Hepburn, Bart.; Admiral Sir William J. Hope Johnstone, K.C.B.; Mr Findlay of Easterhill; Mr Johnstone of Bodesbeck; Mr Irvine of Drum; and Mr Swinton, Holyn Bank.

Peruvian Government Guano.—The Secretary stated that, as instructed at last meeting of the Board, he had written to the Foreign Office on the subject of the prices charged by the Peruvian Government for guano in this country and in the United States, and that he had received the following answer:—

"Foreign Office, *December* 10, 1875.

"Sir—I am directed by the Earl of Derby to acknowledge the receipt of your letter of the 2d instant relative to the prices charged by the Peruvian Government on guano exported to Great Britain and the United States, and I am in reply to acquaint you that it appears, from a report on the subject by Her Majesty's Minister at Lima, that the apparently favourable conditions under which guano has hitherto been supplied to the United States by the company which formerly had the exclusive sale of that manure in North America, were granted for the purpose of enabling the company to clear off their stocks rapidly, and thus permit the Peruvian Government to commence open sales of guano; those conditions were, moreover, accorded on account of the heavy advances made by the company to the Peruvian Government. I am to add that Her Majesty's Minister has been instructed to take steps with a view of securing to Great Britain the treatment of the most favoured nation in this matter.—I am, sir, your most obedient humble servant, "T. V. Lister.

"The Secretary of the Highland and Agricultural Society."

Office-Bearers.—The Secretary reported that the names of the noblemen and gentlemen to be proposed by the Directors at the General Meeting on the 19th current, to fill the vacancies in the list for 1876, had been published in terms of the bye-laws.

Transactions.—Mr Howatson of Dornel gave notice, in accordance with his intimation to last meeting of Directors, and in terms of the bye-laws, that he would move, at the General Meeting on the 19th current—"That the free issue of the Transactions be continued."

Hall and Chambers.—The Secretary read the report of the committee, which narrated what took place at former meetings on this subject, including the resolution by the General Meeting on 21st January 1874 approving of the proceedings, and authorising the Directors to take the necessary steps for selling the present property on George IV. Bridge, and acquiring premises in the New Town. The report also stated that an offer had been made of a house in George Street, which the committee were unanimously of opinion would be an eligible site for a hall for the Society, and recommending the same to the Directors for their favourable consideration.

On the motion of Mr Walker of Bowland, seconded by Mr Stewart of Ingliston, the Board approved of the report of the committee, and remitted to the General Meeting to decide whether the proposed purchase shall be made or not, with an expres-

sion of opinion on the part of the Directors that the site of the house in George Street is desirable, and the price fair; and that if the Society's Chambers are to be moved to a suitable position in the New Town, the expense of making the change will in all probability be increased by further delay.

New Members.—The list of candidates for admission as Members at the General Meeting was submitted.

Finance.—Abstracts of the accounts for 1874–75 were submitted and signed, in terms of the bye-laws, by two members of the Finance Committee and by the auditor.

Chemical Department.—The following report by the Special Committee was read:—

Remit to Committee.—"It was remitted to a committee—consisting of Sir Thomas Buchan Hepburn, Bart., convener; Mr Pettigrew Wilson of Polquhairn; Mr Swinton, Holyn Bank; and Mr Walker of Bowland—to draw up a report for the consideration of the next meeting of the Board with reference to the resolution by the General Meeting in June on the establishment of agricultural experimental stations."

Documents submitted to Committee.—1. Report to General Meeting, 16th June 1875. 2. Resolution by General Meeting. 3. Proposals by Colonel Innes of Learney. 4. Letter from Mr Macdonald, Cluny Castle. 5. Proceedings of the Aberdeenshire Agricultural Association.

Report by Committee.—In terms of the above remit, your committee met on the 22d of December, when the various documents were taken up *seriatim*, and received the most careful consideration.

1.—*Report to General Meeting.*—Your committee find that the report to the General Meeting was in the following terms:—[This appears in the Report of the General Meeting on 16th June 1875.]

To the above report your committee can see no possible objection, though no doubt there are details which the Directors may find it necessary to rearrange; but at present they do not see any reason to alter it.

2.—*Resolution by General Meeting.*—The resolution passed by the General Meeting on 16th June was in the following terms:—"The meeting having had submitted to it by the Directors a report on the chemical department, approves of the arrangements, in so far as explained in the report, for organising and carrying on experimental stations of the kind described in the Society's memorial to the Board of Trade, and for a period of seven years, if the Directors and Society see fit; but disapproves of the proposal contained in the report to appoint a chemist for the Society, it being understood that whenever chemical analyses are required, or chemical advice wished for in connection with the experimental stations or otherwise, the Directors are empowered to employ or consult qualified agricultural chemists practising in any part of the country." Your committee are glad that the General Meeting approved of the organisation and carrying on of agricultural experimental stations. They cannot, however, help expressing their regret at the result of the vote taken at the General Meeting, whereby it was resolved by the small majority of three to discontinue the services of a permanent chemist attached to the Society—an office which had existed for twenty-eight years. Your committee would add that the resolution had been in substance previously moved at a meeting of Directors, and negatived by all the members except the mover. No doubt the resolution gives the Directors power to employ the services of chemists resident in any part of the country when required. But your committee cannot recommend the adoption of these experimental stations without in the first place selecting a chemist thoroughly trained in scientific research, whose duties it shall be, along with the agricultural inspector, to confer with the Directors, or a committee of them appointed for the purpose, in drawing up the regulations and conditions under which these stations are to be conducted, and who, from being an officer of the Society, would take a deep and lively interest in their success. By the resolution which approves of part of the Directors' report, they are required to institute a system of experimental investigations at several stations to be selected by them, with the view of testing the relative values of different climates, soils, and modes of cultivation, manuring, cropping, &c. This was precisely what the Directors proposed to do, guided and aided by a scientific chemist in whom they would have confidence, but the resolution referred to debars them from engaging the continuous services of such an officer. Now, both at the very outset and throughout the whole of their proceedings in this matter, it appears to your committee that the Board requires the constant advice of a chemist who shall be responsible for the scientific conduct and results of the experiments to be undertaken. Such an officer would be required to ascertain among other facts—(1.) the constituents of the soil of the several stations; (2.) the constituents of the manures intended to be applied to each particular crop; and (3.) he will afterwards have to ascertain what portion of each manure the particular crop has taken up, what remains in the ground after the crop is removed, how much of the manure has been carried of by drainage or other causes, and if any of the manures combining chemically with other substances have become unavailable for the food of plants. Your committee would repeat that it is their

opinion that the Directors cannot proceed to establish experimental stations without the assistance of a chemist carrying on the arrangements from their beginning to their termination, and this can only be practically carried out by a chemist on whose services the Society could continuously depend. It would be merely wasting the funds placed at their disposal were the Directors to proceed further without such professional aid. It therefore appears to the committee that the Directors should invite the General Meeting to reconsider the resolution disapproving of the appointment of a permanent chemist, and request authority to secure the services of a gentleman thoroughly qualified.

3.—*Colonel Innes' Proposals.*—Your committee find that the chief points embraced in Colonel Innes' proposals were :—(1.) That an invitation should be given to district societies and to individuals disposed to co-operate in the formation of an association by means of which experimental stations may be conducted on a uniform plan to communicate with the secretary ; (2.) that the organisation and management of such an association would furnish adequate employment for the Society's agricultural inspector ; (3.) that the Society might provide for the chemical analyses required for such experiments by the employment of a salaried chemist or otherwise ; and (4.) that any funds available after providing for these objects might be offered as grants in aid of the working expenses of the several associated experimental stations. Under this head your committee have to report that the plan suggested has been published in the Society's Premium Book since 1873, when the assistant chemist was appointed, whose chief duty was to be the inspector of agricultural experiments, conducted by a local committee of members who made application for them, and who were to receive assistance from the Society. No application, however, was ever made for assistance under this arrangement.

4.—*Letter from Mr Macdonald, Cluny Castle.*—In Mr Macdonald's letter it was intimated that upwards of L.600 had been subscribed towards the establishment and maintenance for three years of three agricultural experimental stations in the north-east of Aberdeenshire, and the hope of the committee, on behalf of which Mr Macdonald wrote, was expressed that a grant in aid of at least one-third of the sum subscribed would be given by the Society for three years, it not being considered necessary to make provision in the meantime for continuing the experimental stations longer, as it was hoped the expediency of establishing such stations would be undertaken by Government. On this communication your committee feel that they cannot offer an opinion until the arrangements in regard to the appointment of a chemist have been settled, as according to the proposed scheme the whole available funds of the Society would be required for conducting their own experiments.

5.—*Proceedings of the Aberdeenshire Agricultural Association.*—Under this head your committee need only remark that the association have fixed on five stations, and that before entering on their experiments have appointed a committee to look out for a chemist to take charge of them.

On the motion of Colonel Innes of Learney, the Board unanimously approved of the report, and resolved to recommend the General Meeting to authorise the Directors to organise such experimental stations as they may find practicable with the funds at their disposal, and to contribute in aid of experimental stations established by local associations on such conditions as the Directors may consider necessary, and for these purposes to appoint a properly qualified chemist as an officer of the Society.

Aberdeen Show, 1876.—The report of the meeting of members held at Aberdeen on the 17th December, when the premium list and regulations for the General Show to be held there this year were submitted and approved of, subject to the following suggestions for the consideration of the Board :—(1.) That instead of two premiums of L.6 and L.3 and L.5 and L.2, there should be three of L.8, L.4, and L.2, and L.6, L.3, and L.1 respectively, for cross oxen and heifers. (2.) That fat stock should be disqualified unless the breeders' names were given. (3.) That there should be a premium for leaping over hurdles. (4.) That goats be admitted to the show-yard. The Board agreed (1.) To increase the premiums for cross oxen and heifers, and to offer premiums for leaping as recommended. (2.) That every endeavour should be made to obtain accurate information as to the breeders of all animals. (3.) That it is quite in accordance with the rules to admit goats into the show-yard as extra stock. The Board then took into consideration letters from Mr Jenkins, secretary of the Royal Agricultural Society of England, as to the date of the Show at Birmingham—which has been fixed to be held from the 19th to the 24th July, both inclusive—when, after careful deliberation, the Directors resolved to adhere to the date fixed on for the Aberdeen Show—namely, from the 25th to the 28th of July, both inclusive—believing that any alteration to a later date would not be advisable.

Proposed Show at Edinburgh, 1877.—The Secretary reported that a meeting of members connected with the district was held in the Society's Hall, 3 George IV. Bridge, on the 15th of December, when the classes of stock as arranged by the Directors were approved of, subject to a suggestion that there should be two sections for yeld

mares or geldings, suitable for field, foaled before 1st January 1873—one for heavy and one for light weights. The Board approved of the suggestion, and agreed to add a class for leaping.

Agricultural Education.—On the motion of Colonel Innes of Learney, the secretary was instructed again to communicate with the Science and Art Department in reference to the Society's memorial, dated 14th July 1874, to the Lords of the Committee of Council on Education, praying that the science of Agriculture should be included in the list of subjects towards instruction in which aid is granted by the Science and Art Department.

Foot-and-Mouth Disease.—The Board took into consideration the great prevalence of foot-and-mouth disease at present in the country, and it was resolved to prepare a memorial to the Government on the subject, to be laid before the General Meeting on the 19th.

MEETING OF DIRECTORS, 19th JANUARY 1876.

Present—The Duke of Buccleuch, K.G.; The Earl of Glasgow; Sir Alexr. Jardine of Applegarth, Bart.; Sir Wm. Stirling Maxwell of Pollock, Bart. M.P.; Sir George Macpherson Grant of Ballindalloch, Bart.; Professor Balfour; Mr Graham Binny, W.S.; Mr Dundas of Arniston; Mr Findlay of Easterhill; Mr Gillon of Wallhouse; Mr Milne Home of Wedderburn; Mr Howatson of Dornel; Mr Hunter of Thurston; Mr Hutchison of Carlowrie; Colonel Innes of Learney; Mr Irvine of Drum; Mr Johnstone of Bodesbeck; Mr Small Keir of Kindrogan; Mr Mackenzie of Portmore; Mr John Ord Mackenzie of Dolphinton; Mr Kenneth Mackenzie, C.A.; Mr Martin, yr. of Auchendennan; Mr Munro, Fairnington; Mr Murray of Dollerie; Mr Scot Skirving; Mr Campbell Swinton of Kimmerghame; Mr Swinton, Holyn Bank; Captain Tod of Howden; Mr Pettigrew Wilson of Polquhairn; Professor Wilson. Mr Small Keir in the chair. Apologies were reported for the absence of Sir Thomas Buchan Hepburn of Smeaton, Bart.; Admiral Sir Wm. J. Hope Johnstone, K.C.B.; and Mr Walker of Bowland.

The business had reference chiefly to the various matters to be brought before the General Meeting.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 16TH JUNE 1875.

Mr Patrick Small Keir of Kindrogan, Senior Director, in the Chair.

New Members.—The Secretary read the list of proposed members, 188 in number, who were duly elected members of the Society.

Free Life Members.—The following holders of the Society's agricultural diploma, 4 in number, were balloted for and admitted as free life members of the Society in terms of the Bye-Laws:—Thomas Coker Beck, Foleshill, Coventry; William Kennedy, 89 Marine Parade, Brighton; Geo. Burn Murdoch, Greenhill Lodge, Edinburgh; Robert W. E. Murray, Wester Housebyres, Galashiels.

The Glasgow Show.—Captain Gillon of Wallhouse gave in the following report in regard to the arrangements for the forthcoming Show at Glasgow:—The arrangements for the Show at Glasgow, which takes place on the 27th, 28th, 29th, and 30th July, are progressing most favourably, and the Directors are cherishing the hope that it will prove one of the most successful ever held under the auspices of the Society. The Directors are on this, as on all former occasions, receiving the most cordial aid and assistance from the Lord Provost and Magistrates of Glasgow. Besides the use of the Green, the Town Council have sent a contribution of L.200. Four out of the five counties connected with the Show have subscribed as follow:—Lanark, L.899; Ayr, L.350; Argyll, L.200; and Bute, L.47; Renfrewshire has also kindly contributed, but the amount realised has not yet been intimated. The following is a comparative state of the entries:—

	In 1875.	In 1867.
Cattle,	411	286
Horses,	405	212
Sheep,	568	505
Swine,	58	80
Poultry,	665	450
Dairy Produce,	152	143
Implements,	2220	1344

At a meeting held at Glasgow on the 9th the following committees were appointed:—

Admission of Stock.—Messrs Forrest of Auchenraith, convener; Allan Kirkwood, Glasgow, and H. R. B. Peile, Greenock.

Admission of Public.—Messrs Jas. Hunter, Glasgow, convener; Russell, Airdrie; Hendrie, Scotstown House; Blackley, Glasgow; Hall Maxwell of Dargavel; and Macdowall, yr. of Garthland.

Banquet.—The Lord Provost, convener; Sir James Lumsden; Messrs David Cross, Glasgow; Gordon of Aitkenhead; Wakefield, Eastwood Park; and George Stoddart.

Ball.—Mr Kippen of Busby, convener; Colonel Buchanan of Drumpellier; Messrs Hall Maxwell of Dargavel; Campbell Douglas of Mains; John Dykes, jun., Glasgow; Martin, yr. of Auchendennan; Findlay of Easterhill; Cooper, yr. of Failford.

Forage.—Messrs David Cross, convener; Scott, Haughead; Allan Steven of Clincart.

Police.—The Lord Provost, convener; Bailie Osborne; and Mr Wakefield.

Accommodation of Strangers.—Messrs James King, Lord Dean of Guild, convener; John Dykes, jun., Glasgow; and Bailie Osborne. The erection of the showyard is again undertaken by Mr Matthew Richardson of Annan, whose contract continues till after the Aberdeen Show next year; and other contracts are in course of being made. There will be four refreshment-rooms in the yard, besides one for the special use of attendants in charge of stock. I need not occupy the time of the meeting by going over the programme. It may suffice to say that the yard will be open on the four days at the usual hours. By the regulations of last year no animal could be taken out of its stall after 9 A.M. during the Show, except by order of the judges or with permission of the Secretary. The Directors have on this occasion extended the time to ten o'clock. It was at first the intention of the Directors not to declare the

award of the prizes for leaping till after the last parade on Friday. They have to-day resolved that the prizes shall be decided immediately after the last parade on Wednesday. This, it is thought, will be satisfactory both to exhibitors and the public. I have lastly to remind those who desire tickets of admission to make application to the Secretary. Tickets have been sent to those residing in the district, so far as known. If there be any who, by change of residence or otherwise, have not been supplied, they are requested to make application as soon as possible.

The Hon. G. Waldegrave Leslie asked if there were many entries of steam cultivators among the implements?

The Secretary said he could not yet state the number, as it had not been made up; but the information would be given as soon as possible.

Aberdeen Show, 1876.—Captain Gillon reported with reference to the proposed Show at Aberdeen in 1876 that the arrangements, so far as they could be perfected up to this time, were in a very satisfactory state.

Selection of Judges.—In the absence of Mr Barclay, M.P., his motion as to the selection of judges was read; and the report of the Directors as to the appointment of judges was unanimously adopted.

Agricultural Education.—Mr Walker of Bowland said—I have to report that the examinations for the Society's agricultural certificate and diploma took place on the 23d and 24th March, when ten gentlemen enrolled their names as candidates, and that the examinations resulted in the following passing:—For diploma—Mr William Kennedy, 89 Marine Parade, Brighton, who obtained the certificate in 1874. For certificate and diploma—Messrs Thomas Coker Beck, George Burn Murdoch, and R. W. E. Murray. For certificate—Messrs John Bramwell, George Henry Catt, Robert Ewing, A. A. Ferguson, and John Scott. The four first-named gentlemen have been to-day elected free life members of the Society, in terms of the Bye-Laws. I have only further to state that the two prizes of L.6 and L.4 annually allowed by the Society to the students who pass the best and second best examinations in the agricultural class in the Edinburgh University have this year been awarded to A. A. Ferguson, Gosfield, and J. J. Brown, Cumberland.

The new Bye-Laws, approved of at the General Meeting held on 20th January, were confirmed in terms of the charter.

Professor Wilson said he had received the following letter from a gentleman in Golspie on the subject of the new scholarships:—"Sir,—I am very desirous to see the questions put to agricultural students as a test of their knowledge in any examination, so as to have an idea of the salient points of the subject. Much interest is attached here to the university scholarships expected to be open for competition in November in connection with the Highland and Agricultural Society. I presume all will be eligible, and awards made to those who show the greatest proficiency in the subjects of examination, no matter whether school or self taught. Kindly say if I am correct in that view, or if there be anything to bar a farmer's son, who may have no instructor but his own exertions, without help from tutor or school, from entering for competition? Feeling the stimulus these bursaries give to youthful farmers,—I am, &c."

Mr D. Milne Home said that that the trustees of the Dollar Institution had appointed a committee to confer with the Directors on the same subject.

Chemical Department.—Sir Thomas Buchan Hepburn read the following report of the Directors:—

"The report by the Directors on the Chemical Department made to the General Meeting on the 20th of January last, having been remitted back to the Board for further consideration, with instructions to bring up a report in June, the Directors, at their first meeting thereafter, namely, on 3d February, referred the subject to a special committee to make suggestions.

"That committee, after several meetings, made a report to the Board.

"On the 7th of April the Directors ordered the report to be printed and circulated among them previous to its being brought up for consideration at their meeting on the 5th of May.

"On that day the Directors resumed consideration of the remit from the General Meeting with the suggestions from the special committee.

"They now beg to recommend as follows:—

"That, considering the advantages which have already been derived from chemistry in its application to agriculture, it is expedient to reorganise a Chemical Department under the cognisance of the Society, for the purpose of conducting investigations on all subjects relating to agriculture.

"That, in connection therewith, a series of carefully conducted experiments in the open ground be instituted.

"That for these purposes a chemist, who shall reside in Edinburgh, and an agricultural inspector be appointed at fixed salaries.

"That the Chemical Department be under the control of the Directors and the chemist.

"That the duties of the chemist shall be—

"To conduct investigations, researches, and experiments on such subjects connected with agricultural chemistry which may be necessary, and prepare an annual report of the same for the Society's Transactions.

"To institute a series of carefully conducted field experiments.

"To make all the necessary analyses required for such experiments.

"To examine the records or reports of the field experiments kept by the agricultural inspector, draw conclusions from them, taking into consideration the meteorological condition of the station, and prepare them for publication in the Society's Transactions.

"To report the work done in the laboratory to the half yearly General Meetings of the Society, and, in analysing for members of the Society, to report any cases of gross adulterations of manures and feeding stuffs that may have come under his notice.

"That the field experiments, or open ground practical work, be under the inspection of the agricultural inspector, whose duties shall be—

"To superintend and conduct all field experiments undertaken by the Society.

"To be responsible for the proper cultivation of the land, and see that when experiments are alike, uniformity, as far as possible, be observed at all the stations.

"To keep complete records of the experiments during their progress and to their completion, noting the peculiarities of soil, climate, altitude, and rainfall, and the mode in which the land has been worked.

"To furnish the chemist from time to time with copies of these records.

"The Directors find that the Society has at its disposal for the purposes of the Chemical Department and field experiments, a sum of L.700, which they recommend should be set aside for a period of seven years.

"In carrying out this recommendation they suggest that the L.700 should be expended as follows:—

Chemist's salary,	L.300	0	0
Agricultural inspector's salary,	150	0	0
Travelling expenses of inspector,	50	0	0
Amount for stations—say four of about 5 acres each,	200	0	0
	L.700	0	0

"After appointing a qualified chemist and an agricultural inspector competent to institute and carry on such experimental stations, it will be the first duty of the Directors to make the necessary arrangements with proprietors or tenants for the use of suitable land in different districts of Scotland, for a term of years, and for the services of the work-people and horses on the farms for the proper cultivation of the land, providing all manures, seeds, &c., required for experiments.

"It will afterwards be the duty of the chemist and the agricultural inspector to frame and complete a detailed scheme on the methods of conducting stations fitted to the different localities where they are to be placed, and on the objects which should first be made subjects of research, and submit the same to the Directors.

"The Memorial adopted at the General Meeting in January last to the President of the Board of Trade, urging on the Government the expediency of establishing agricultural experimental stations in different districts of Scotland, was duly forwarded, but the Directors at their meeting in February resolved to ask the Board of Trade to delay submitting it for the consideration of Her Majesty's Government, as they were then preparing the scheme now suggested, and which they thought should accompany the Memorial. To this request the Board of Trade readily complied.

"The Directors now consider that it would be advisable that a deputation from the Society should wait on Government to submit this scheme and explain their views in greater detail than was done in the Memorial.

"They trust, from the great value and importance of the subject, that Government will be disposed to provide for the scheme the same sum as the Society, or a larger amount, in which case the Society would be enabled to have a greater number of experimental stations, and on a more extended scale."

Sir THOMAS moved the adoption of the report.

The SECRETARY read the following communication from Mr R. Macdonald, Cluny Castle, Aberdeen:—"Askernish House, South Uist, Lochmaddy, June 9, 1875.—Dear Sir,—When I left Cluny Castle I intended to be back in time to be present at your General Meeting in Edinburgh, to be held on the 16th inst., so as to make an application for a money grant towards the establishment and maintenance for three years of three agricultural experimental stations, representing—(1) Light sharp soil, such as Deeside, Aberdeenshire; (2) loamy soil, such as the Vales of the Don or Deveron; and (3) stiff clay soils. I may state that proprietors and tenants in the counties of Aberdeen, Banff, and Kincardine have already subscribed upwards of L.600 to be distributed over three years, and the most of the committee appointed are members of the Highland and Agricultural Society. As your Society have repeatedly, by resolutions at

their meetings, and by memorials to the Board of Trade, urged the necessity of advancing the science and practice of agriculture by means of experimental stations, the committee hope that a grant in aid of at least one-third of the sums subscribed, and to be subscribed by local parties, will readily be given by your Society for three years, for the maintenance of the stations about to be established for the north-eastern districts of Scotland. The committee are fully impressed with the conviction that the management of the stations should be continuously conducted with scientific care and systematic precision; and they are glad to have reason to believe that thoroughly qualified parties can be got in Aberdeen and the neighbourhood to superintend and conduct the experiments quite satisfactorily. It is not considered necessary to make provision in the meantime for continuing the experimental stations longer than three years, as it is hoped that the representations by the Highland and Agricultural Society and by others to the Government will soon be favourably considered, and the expediency of establishing such stations admitted by the Legislature. Please submit this application to the meeting on the 16th inst., after the report by the Directors on the Chemical Department is read, and favour me with a reply, addressed to Cluny Castle, Aberdeen.—I am, dear sir, yours faithfully, (Signed) RANALD MACDONALD, convener of committee. F. N. Menzies, Esq., Secretary Highland and Agricultural Society, Geo. IV. Bridge, Edinburgh."

Colonel INNES of Learney said he had received a letter from Mr Macdonald that morning requesting him to support this letter, and he could do so very cordially, so far as it was consistent with the decision already arrived at by the Directors; but he thought he could not do so more effectually and satisfactorily than by bringing before the meeting a resolution which he had independently proposed to lay before the Directors, viz.:—"Considering that the funds at command of the Society may be insufficient, after paying the salaries of the chemist and scientific manager, to meet the expenses of working experimental stations on an adequate scale, and also considering that larger and more reliable results of experiments may be attained by combining in association for that object the means and efforts of several districts, it is desirable that the Highland and Agricultural Society should undertake to establish such an association by means of which the experimental stations maintained by local societies and by individuals may be managed on a uniform plan, and under common rules, and so that the same experiments may be conducted simultaneously under varied conditions of soil and climate: That the organisation and management of such an association would furnish adequate employment for the agricultural inspector of the Highland and Agricultural Society, his duties being to organise the system of associated experimental stations, to aid in drawing up the rules under which they are to be worked, to periodically visit and inspect the progress of the experiments, to superintend and check the weighing and measuring of substances, to tabulate results and prepare report: That the Highland and Agricultural Society might also provide for the chemical analyses required for the experiments of the association, by the employment of a salaried chemist or otherwise as may be found most expedient, and that any funds available after providing for these objects might be offered as grants in aid of the working expenses of the several associated experimental stations, under the condition that they are conducted strictly in accordance with the rules of the association: That the formation of such an association would multiply the usefulness of any experimental stations which the Highland and Agricultural Society may find the means of working under the plan proposed by the Directors, and disseminate more widely the practical knowledge which may be acquired as the result of the experiments; and that without loss of time an invitation should be given to district societies and to individuals who may be disposed to co-operate in the formation of such an association to communicate with the Secretary." He was under the pleasing anticipation that the resolution might not, when the opinion of the Directors was expressed upon it, be altogether unacceptable. It was not inconsistent with the scheme of the Directors, would extend its operations, and be a source of considerable support to it.

The CHAIRMAN having asked if Sir Thomas Hepburn's motion for the adoption of the report was seconded,

Colonel INNES said that he seconded the motion.

Mr WILSON, Edington Mains, said that when he last had the opportunity of expressing his views in reference to this matter, he was disposed to approve of a much larger sum being given, so that a chemist of the highest qualifications should be engaged, whose services would be wholly at the disposal of the Society. Now that the whole sum allotted by the Society for the purposes referred to in the report was L.700, and they were to expend L.300 out of that on a chemist, he did not think it wise that they should agree to that before knowing what the chemist was to do. He thought that the experimental stations, which he had desired to see in operation long ago, and were meeting with approval throughout the country, should be first put in operation. Any chemical advice that was needed could then be applied for from the best chemists of the country, who would be paid for it. The Society had a salaried chemist for a

considerable number of years, and they knew that Dr Anderson was highly qualified for the work devolving upon him; but if they were to take a sheet of paper with two columns, and put on one side the money paid to Dr Anderson by the Society, and on the other the practical result, he thought that these two columns would present a strange contrast. That should make them cautious about spending their money in that way again. He moved as follows:—"The meeting having had submitted to it by the Directors a report on the Chemical Department, approves of the arrangements, in so far as explained in the report, for organising and carrying on experimental stations of the kind described in the Society's memorial to the Board of Trade, and for a period of seven years, if the Directors and Society see fit, but disapproves of the proposal contained in the report to appoint a chemist for the Society, it being understood that whenever chemical analyses are required, or chemical advice wished for in connection with the experimental stations or otherwise, the Directors are empowered to employ or consult qualified agricultural chemists practising in any part of the country."

Mr Milne Home of Wedderburn seconded Mr Wilson's amendment. He was sorry to differ from the Directors on this point. He had all his life felt the immense benefit of the application of chemistry to agriculture, and he was one of those who assisted in establishing the Agricultural Chemistry Association, which brought Professor Johnston to this country; but he, like his friend Mr Wilson, deprecated being tied hand and foot to one individual whom they were to appoint and keep as long as he held office for a particular salary, without any guarantee being obtained as to the amount of work he was to perform for the society. They knew well what happened during the past four years. Unfortunately Dr Anderson, for whom he had the greatest possible respect, got into bad health, and for two years drew his salary without doing anything for the Society; and his assistant, Mr Dewar, to whom he had listened in the Royal Society with much admiration, had told them in a letter which he recently published that he was not so much an agricultural as a scientific chemist. Accordingly, his papers before that Society had not been on agriculture. He had not devoted his attention to that part of the subject. They had, therefore, been paying for two years L.1,000 to these two gentlemen, and they had not had a bit of work done for the special benefit of the Society. That was a system they should avoid in future. There were chemists who devoted themselves to organic and others to inorganic chemistry. The Society required sometimes the one and sometimes the other; and if they tied themselves up to one man, they deprived themselves of having the best means of advice they could acquire. The two reasons assigned in the report for the permanent appointment scarcely met his view. The first was that the Directors were desirous of carrying on researches on all subjects connected with agriculture. He would be glad to know what guarantee there would be for such researches further than by the terms of the engagement, under which they appointed the chemist at a salary of L.300, and left him to carry on such investigations and researches as he could find time for? Then as to the chemical analyses of the soil and products at the experimental stations, the Directors could get all that information in the way which he and Mr Wilson had pointed out. He had consulted on this point the highest agricultural authority in Britain, Mr Lawes of Rothamstead—a gentleman who had for twenty or thirty years had more experience in carrying on experiments in the field than any other gentleman in Britain, and who had made discoveries that were likely to revolutionise the whole agriculture in Scotland and in England. He said they should wait until they saw the result of their experimental stations, and that if they found it necessary they should employ a chemist—an outsider, and not an officer—and request him to make such analyses as they required. He was most highly delighted with the fact that these experimental stations were about to be established in different parts of the country. His proposal would be that the L.300 should be disposed of in this way—L.100 should be reserved for the purpose of carrying on any chemical analyses that might be required in connection with these stations; another L.100 should be set apart to assist such stations as they had heard of in Mr Macdonald's letter, and from Colonel Innes of Learney, and L.100 for rewarding any chemist who came forward and made any important researches or discoveries in the previous year.

Mr Melvin, Bonnington, said that it occurred to him that this matter was not yet ripe for settlement, and that it should still be continued. When Mr Dundas proposed in January that this matter be deferred until the present meeting, Mr Maclagan of Pumpherston, who seconded the motion, stated that it would be his object to apply to the Foreign Office, through Lord Derby, and obtain information from those countries on the Continent where experimental stations had been formed. Lord Derby, he believed, favourably received the application, and had, through the consular agents, obtained reports from those countries. He understood that Mr Maclagan had received a large bundle of them, and he thought they should be in the hands of the Directors, and examined, before any conclusion was come to. The proposal of having no chemist

was somewhat new. They had been speaking of the results of going to a teaching, and perhaps a scientific chemist, and not to a man who devoted his attention entirely to agricultural chemistry. Dr Anderson might have known barley from oats, but he did not know that he would know them until they were shot; and there were many things he did not know in practical agriculture at all. He thought they should not deprive themselves of the right entirely of appointing a practical chemical agriculturist, if they could get such a man. He moved that the consideration of the report be delayed, and that the Directors consider the reports received by the Foreign Office to which he had referred.

The CHAIRMAN—These reports have not been received.

Mr MILNE HOME said that Mr Maclagan had done him the honour of sending him the reports referred to by Mr Melvin for perusal; but he had received them only yesterday. They gave an account of the stations in Austria, Belgium, and France, and also returns from Russia and Holland, in which there were no stations at present. But it appeared from these reports that the Governments both of Russia and Holland were at this moment considering the subject. A reporter had been sent to Germany by the Russian Government with the view of reporting on these stations and introducing them into Russia. He thought it important that the deputation appointed to go to London should do so immediately, as they would go at the very time when Earl Derby saw from these reports what was about to be done by Foreign Governments. He would be sorry if the proposal were hung up for six months. That would be scarcely to the credit of the Society, after having intimated to her Majesty's Government in February that a deputation was to be sent forthwith to support the Memorial.

The CHAIRMAN said he understood the reports had been laid before Mr Milne Home individually, and that they were not before the Society as a society.

Mr MELVIN said they might not have been received by Mr Milne Home, simply because Mr Maclagan thought he would present them to the Society.

Mr SCOT-SKIRVING pointed out that Mr Wilson and Mr Milne Home had argued the matter entirely on one half of its premises. To his mind the greatest reason for appointing a chemist had nothing to do with experimental stations at all. It gave them a man in whom the farmers of Scotland had confidence in sending their artificial manures and foods for analysis. There was much reason in what was said about their departed frend Dr Anderson. He always thought, for one, that Dr Anderson was a great deal too timid in not tabling the names of those from whom the adulterated stuffs were obtained. The chemist should be prepared to give the names in such cases, and if they dared to prosecute, the Society should stand or fall by him. Referring to the question of salary, he stated that he quite conceived that they could obtain the services of a good chemist at a smaller salary than even was proposed for the stamp it would give him—his appointment showing that the Society had confidence in him.

Sir THOMAS HEPBURN hoped the meeting would not consent to Mr Melvin's proposal, so as to delay the matter. If it were delayed, he thought the Highland Society would become the laughing-stock of the whole country. It appeared to him that if they were to have experimental stations without the aid of a chemist, they would be unable to proceed in a scientific manner. The chemist could consider what were the constituents of the soil and of the manures applied, and, after the crop had reached perfection, tell how much of the manure remained in the soil, and afford other information which would be available in future years. Mr Milne Home stated that Mr Lawes had given him his advice to the effect that they should not have anything to do with chemistry. That gentleman had been kind enough to let him see the correspondence, from which it appeared that the objection was entirely on the ground of the expense. The experiments at Rothamstead had been carried on for many years, but they were isolated; and it seemed to him that it would be desirable that the Highland Society should carry out and repeat many of these experiments in order to prove their results. They were unquestionably important, both to the landed proprietors and the agriculturists. Mr Lawes had grown barley on the same ground for fifteen or twenty years by the use of a small amount of artificial manures, and done so profitably. If that were the case, and they could grow white crops in succession, their system of leases should be modified, and the tenant have greater freedom in the working of the land. Then there was the question of compensation for unexhausted manures. Perhaps that subject was not of so much importance in Scotland, where they had nineteen and twenty years' leases; but in England they were tenants at will. There was no data on which that could be settled, except what was afforded by a chemist. The members of the Society had had the privilege of having their analyses made by its chemist at a lower rate than to the public. He was told that that was illegal, and that their charter did not permit it. As far as he could read the charter, such a purpose appeared to him to be quite in accordance with it.

Mr SMITH, Whittingham, said that Mr Wilson and his supporters seemed only anxious that the Society should get value for the money it paid to a chemist. He

thought the Directors would keep that in view in making the appointment. It was desirable to have a chemist, if they were to carry out their experiments with anything like uniformity at the different stations.

Mr GREIG (of Messrs Fowler & Co.) remarked with reference to the observation that members of the Society received benefit by getting analyses at reduced charges, that other chemists gave analyses at the same rates as the chemist of the Society. If the motion of Mr Wilson were carried, he hoped the Directors would see that they had the services of a chemist exclusively.

Mr WALKER of Bowland stated that the universal opinion of the members of the Society, which numbered 4000, and of whom a very small proportion were present, was in favour of the experimental stations. The appointment of a chemist as an officer of the Society was of great importance for the purpose of securing trustworthy analyses and consultation. As to the remark of the last speaker that the members of the Society derived no benefit by the appointment of a chemist, the result had been that the other chemists in Scotland had come down to the rates adopted by the Society.

Mr GOODLET, Bolshan, thought there must be a chemist at the head of affairs in connection with these experimental stations if they were to be carried on successfully. But he quite agreed with the proposal of Mr Milne Home and Mr Wilson in the meantime, because he thought that the amount of money which the Society could afford to the experimental stations was so small that they would never be able to carry them out with efficiency.

Sir THOMAS HEPBURN pointed out that the appointment was made yearly, and said that if the chemist did not perform the duties given to him by the Directors in the carrying out of the experimental stations, there was no necessity for his services being continued.

Mr ROBERTSON, Newmains, approved of Mr Melvin's motion for delay.

Captain TOD of Howden suggested that there should be a special general meeting to consider the subject at Glasgow.

On a division, taken by show of hands, 21 voted for the amendment of Mr Melvin, and 38 against. The amendment of Mr Melvin was therefore lost, and a division took place between Sir Thomas Hepburn's motion, that the report be approved of, and the amendment of Mr Wilson. The amendment of Mr Wilson was carried by 33 to 30.

Mr WALKER suggested that, seeing the vote was so close, the members should take different sides of the house, and the numbers recounted; but, after some discussion, the Hon. Waldegrave Leslie moved that they proceed to the next business, which was agreed to.

Colonel INNES then brought forward the motion which he had read at the opening of the discussion in regard to the chemical department. He said that the tenor of his proposal was to place in the hands of the Directors the power of forming and organising an association which would join with the Society in the support and extension of the scheme of experimental stations.

Mr WILSON said he thought the proposal, if carried out, would simply be setting up a rival to the Society. At all events, the local societies should come to the Directors of the Highland Society with a definite proposal.

Mr MILNE HOME said he approved of the object, although not in the form proposed by Colonel Innes, and he thought it should be remitted to the Directors.

Colonel INNES made several alterations on his motion, including the deletion of the reference to the appointment of a chemist.

It was ultimately agreed to remit the matter to the Directors to deal with it, so far as consistent with the resolution the meeting had already come to with regard to the chemical department.

RESIGNATION OF PROFESSOR DEWAR.—Sir THOMAS HEPBURN said—I regret to intimate the resignation of Professor Dewar, who has been appointed to a Professorship in the University of Cambridge. When the announcement was read by the Directors, a resolution was adopted expressing their sense of the value of his services, and their regret at the loss to the Society of so distinguished a chemist. They at the same time congratulated him on his appointment to such an honourable position. The resignation does not take effect till November, and the Society will have the benefit of Professor Dewar's services till then.

Professor DEWAR read the following report:—*Chemical Laboratory, Clyde Street Hall, Edinburgh, 16th June* 1875.—I have to report that the work of the chemical department during the last six months has been steadily on the increase, and that as an illustration of the laboratory work, I may state that during the last three weeks twenty samples of manures and feeding stuffs have been analysed. No serious cases of adulteration have come under my observation, if we except the very inferior character of some samples of guano. For instance, a sample of Penguin guano, containing as much as 32 per cent. of sand and clay, had an estimated value of L.5 per ton; whereas the market value marked on the specimen was L.10 per ton. As the composition of

guano is now so variable, I think the agriculturist would do well to get a separate analysis with every new sample. Only one case of suspected poisoning has recently occurred, and the stomach in this case was found to contain lead.

Professor DEWAR then said that, if it was in order, he would reply to some statements made by Mr Milne Home.

The CHAIRMAN said it was not in order.

THE TRANSACTIONS.—Mr IRVINE of Drum gave in the report on the "Transactions," and laid on the table volume VII. of the Fourth Series of the Society's Transactions. He said that, in accordance with the suggestions contained in a report on the chemical department and agricultural education, approved of at last General Meeting, the free issue to members which was commenced in 1866 ceased with this volume, and that members desirous of having the Transactions in future would be charged cost price.

The report was adopted.

VETERINARY DEPARTMENT.—Captain TOD of Howden said—I have to report that th annual public examinations for the Society's veterinary certificate took place on the 12th, 13th, and 14th April, when forty students presented themselves for examination, and that thirty-two passed. As the names have already appeared in the newspapers, it is unnecessary to report them on this occasion. Besides the usual silver medals given to the three veterinary colleges in Scotland for best class examination on the various branches taught in the schools, two medium gold medals were given to the students who passed the best practical and best general examination. These medals were awarded respectively to—1. Mr W. MacGwire, Dublin; 2. Mr Israel Print, Wolford, Warwickshire.

The report was adopted.

The Hon. G. WALDEGRAVE LESLIE then moved—"That it be referred to the Directors of this Society to consider the propriety of granting a sum of L.100 for five years to the fund proposed to be raised by Lord Calthorpe for improving and maintaining a proper supply of horses in Scotland, and also of organising a mode of receiving donations or subscriptions from private individuals or companies in aid of the purposes of Lord Calthorpe's scheme as regards Scotland." He was authorised to say that if private contributions were received, the Baroness Burdett Coutts, who had distinguished herself in the cause of humanity to animals, would give L.100 towards the object in view.

Colonel ANSTRUTHER THOMSON seconded the motion; which was unanimously agreed to.

ORDNANCE SURVEY.—Mr WALKER of Bowland laid on the table copies of the memorial to the Treasury in regard to the Ordnance Survey. The concluding part of the memorial was as follows:—"That your memorialists feel bound to protest in the strongest terms against the determination of the Board of Works to postpone the replotting of the plans of the counties of Edinburgh, Fife, Haddington, Wigtown, and Kirkcudbright upon the 1-2500 scale. The amount of work which it proposed to postpone (the replotting of land already surveyed) is comparatively small. It is estimated that L.50,000 would cover what remains to be done. It also happens that although the area thus affected is comparatively small in extent, it comprises the suburbs of Edinburgh, and the thickly-inhabited districts of the counties of Fife, Edinburgh, and Haddington, with their numerous mining villages—an area in which this demand for 1-2500 plans will be large, and where their publication is anxiously looked for. That your memorialists do not consider they have any right to ask the Treasury to increase the annual Parliamentary grant for the purposes of the Survey, but in their position their duty is to urge the allotments of a fair share of the Parliamentary grant towards the publication of the Scotch plans until the completion of the work. This they have a right to expect, and they regret the necessity they lie under of again memorialising the Treasury against the interruption of the publication of the plans of Scotland. After the termination of the former correspondence upon the Scotch survey in 1846, your memorialists had hoped that the work would not have been again interrupted."

STEAM CULTIVATION.—Mr SWINTON, Holynbank, gave in the following report on steam cultivation:—"I have to report that, in terms of the remit from the last General Meeting, the special committee on steam cultivation has been added to the list of the standing committees of the Society. At a meeting on the 31st March the committee took into consideration (1) the motion by the Hon. George Waldegrave Leslie at the last General Meeting relative to the committee receiving reports from those members of the Society who employ steam cultivation, and recommending rewards or medals as encouragement for decided improvements in the method of cheapness of using steam power for cultivation; and (2) a proposal by Mr Glennie, Fernyflatt, to offer premiums for the encouragement of steam cultivation in Scotland. After careful consideration, the committee reported that they were not prepared to recommend that the Society should offer premiums, but that the Directors might intimate that they are willing to receive from farmers and others employing steam-power in the cultivation of the

soil reports on decided improvements on the method of using steam-power, or for any suggestions whereby the expense of steam-power can be reduced. The committee also recommended that if these reports be considered of sufficient merit the writers should be rewarded."

The suggestions by the committee were approved of by the Board, and the proceedings now reported were published in the newspaper report of the meeting of 7th April.

The report was adopted.

On the motion of the Hon. G. WALDEGRAVE LESLIE, a vote of thanks was given to the Chairman, and the proceedings terminated.

GENERAL MEETING, 19TH JANUARY 1876.

The EARL OF GLASGOW, Vice-President, in the Chair.

The EARL of GLASGOW said that, in the absence of his Royal Highness the Prince of Wales, it fell to him, as one of the vice-presidents, to take the chair. He would not trouble the meeting with any introductory remarks from the chair, as they had a long and important programme of business before them, and he would at once proceed with it.

ELECTION OF MEMBERS.—124 new Members were then balloted for and elected.

OFFICE-BEARERS.—The SECRETARY read the following list of new Office-Bearers in place of those retiring by rotation :—*Vice-Presidents.*—The Earl of Strathmore; the Earl of Kintore ; the Earl of Aberdeen ; the Earl of Fife, K.T. *Ordinary Directors.* —Sir John Marjoribanks of Lees, Bart.; James Cochrane, Little Haddo, Aberdeen ; Robert Copland, Mill of Ardlethen, Ellon ; Thomas Ferguson, Kinnochtry, Coupar-Angus ; Andrew Gillon of Wallhouse ; Alexander Forbes Irvine of Drum ; James Townsend Oswald of Dunnikier ; Adam Smith, Stevenson Mains, Haddington. *Extraordinary Directors.*—The Lord Provost of Aberdeen, Sir James Horn Burnett of Leys, Bart.; Sir John Ogilvy of Inverquharity, Bart.; Sir William Forbes of Craigievar, Bart. ; Sir James Dalrymple Horn Elphinstone of Horn and Logie Elphinstone, Bart., M.P.; Sir Thomas Gladstone of Fasque, Bart.; Robert William Duff of Fetteresso, M.P. ; Lieutenant-Colonel George Ferguson of Pitfour ; John Gordon of Cluny ; Lieut.-Colonel William M'Inroy of The Burn.

Mr HUNTER of Blackness said that, if it was in order, he would beg to move that in future the Directors of the Society be named in open meeting, not by nomination of existing Directors. That was the usual method adopted in all large societies. He thought the system of self-election by the Directors derogatory to the agriculture of Scotland. If the motion was not competent, he would give notice of it.

A MEMBER stated that he understood there was a promise last year that the name of Mr M'Combie, M.P., would be added to the list of Directors. If such a promise had been made, it ought surely to be kept.

Another MEMBER asked if Mr M'Combie had not refused to take a seat at the Board? If so, he would like to hear the letter read.

Captain TOD of Howden said that Mr M'Combie was asked to be a Director, but refused. His letter was as follows :—

"Tillyfour, December 6, 1875.—Dear Sir,—I duly received your letter of the 2d inst., in which you say, 'I am instructed by the Directors to request you to allow them to nominate you as an extraordinary Director of the Society at the General Meeting in January.' My acceptance of that office would not serve the objects the members had in view who pressed my nomination before the Board as an ordinary Director. I must therefore respectfully decline to be nominated an extraordinary Director.—Yours faithfully, "WILLIAM M'COMBIE.

"F. N. Menzies, Esq., Secy. Highland Society."

Mr WILSON, Edington Mains, did not think that the understanding undoubtedly left on the last Annual Meeting, when Mr M'Combie's name was mentioned, that he would be brought forward on another occasion, had been implemented. What had been offered to him was the position of an extraordinary Director, and what the previous meeting asked was that Mr M'Combie's name should be put on the list of ordinary Directors. The implication in his letter of refusal appeared to be that if he had been asked to take the office of ordinary Director, he would have accepted it. He thought the Directors had made a great mistake.

Mr CAMPBELL SWINTON said he thought his friend Mr Wilson had overlooked the fact that an extraordinary Director had precisely the same rights and privileges as ordinary Directors. He could attend all the meetings and vote at them all ; and the wish of the Directors was to put Mr M'Combie in the most honourable of the two positions.

Mr Hunter was in favour of Lord Kinnaird, who had sent an admirable letter to the newspapers, being elected one of the Directors.

Mr M'Lagan, M.P., said that when the discussion took place last year regarding the election of Mr M'Combie, it was then stated by Captain Tod that the reason why Mr M'Combie was not proposed as an ordinary Director was that he would be proposed an extraordinary member next year. He considered, therefore, that the Directors had implemented their promise in offering him the position of an extraordinary Director. He was glad to have the opportunity of supporting the Directors, who had, he thought, fulfilled their promise, and were entitled to the support of the meeting. He regretted very much that Mr M'Combie had not accepted the honourable position. This Society had few honours indeed to offer to its members, and any man offered the position of extraordinary Director should feel proud of it. He found himself that he had been as an extraordinary Director of quite as much use as an ordinary one. Besides, as an extraordinary Director, one could go to the meetings when he thought proper; whereas, as an ordinary Director, he was expected to be at every meeting, and did not perform his duties unless he was so.

Mr Hunter—I beg to move that the Directors should be nominated by signed lists fourteen days before the meeting.

The Duke of Buccleuch said he was afraid they were getting very irregular in their proceeding, and still more did he regret that it should have taken something of a personal nature, which, of all others, should be avoided in public meetings of all kinds, especially in a Society such as this. He found from the regulations with regard to the nomination of the Directors and extraordinary Directors that "the list of office-bearers to be proposed at the General Meeting shall be published in any two or more of the Edinburgh newspapers fourteen days preceding;" so that those people who had the opportunity of seeing the Edinburgh papers know at all events fourteen days beforehand who were to be proposed. He also found that if any members of this Society thought that others should be proposed, they, although not in the direction, and not entitled to vote, might attend at the meetings of the Directors and declare their opinion.

The list of office-bearers as proposed was then agreed to.

Accounts for 1874–75.—Mr Murray of Dollerie submitted the accounts of the Society for the year 1874–75, which were approved of.

Argyll Naval Fund.—Admiral Maitland Dougall of Scotscraig laid on the table the accounts of the Argyll Naval Fund for 1874–75, which were agreed to.

Hall and Chambers.—Mr John Ord Mackenzie of Dolphinton read a report suggesting the purchase of an eligible site in the New Town on which to erect a suitable hall and chambers for the Society.

After some conversation, it was agreed by a large majority that the Society should remain in its present premises.

Glasgow, Aberdeen, and Edinburgh Shows.—Mr Gillon of Wallhouse read the following reports regarding the Glasgow, Aberdeen, and Edinburgh Shows:—"*Glasgow Show*, 1875.—After the full reports which appeared in the newspapers at the time, it is unnecessary for me to occupy the time of the meeting by any lengthened statement. It may suffice to say that, from the accounts which have just been submitted to the meeting, it will be observed that the Glasgow Show proved in a financial point of view a great success; indeed, I may say by far the most successful ever held under the Society's auspices, the estimated surplus being no less than L.3,316. In other respects I may state shortly that the Show was also very prosperous, the stock generally being of a superior character, and many of the implements very creditable while the forage-yard on this occasion was stated by all parties to be admirably supplied by Mr Buchanan, Glasgow. I have now the pleasure of moving a series of resolutions of thanks to the noblemen and gentlemen to whose co-operation and exertions the Society is so much indebted. 1. That the thanks of the Society be given to the Most Noble the Marquis of Bute, vice-president, for his attendance at the Glasgow Show, and for officiating as chairman at the president's dinner in the unavoidable absence of his Royal Highness the Prince of Wales. 2. That the thanks of the Society be given to the Right Hon. the Earl of Glasgow, vice-president, for acting as croupier on the same occasion. 3. That the thanks of the Society be given to the Commissioners of Supply for the counties of Lanark, Ayr, Argyll, Renfrew, and Bute, for the liberality with which the auxiliary fund was provided. 4. That the thanks of the Society be given to the Hon. James Bain, Lord Provost, and to the Magistrates and Town Council of Glasgow, for the excellent accommodation afforded for the showyard by the free use of the Green, and for the liberal contribution of L.200 in aid of the auxiliary fund. 5. That the thanks of the Society be given to Sir Michael R. Shaw Stewart of Blackhall, Bart., convener, and to the other members of the Committee of Superintendence, for their very efficient co-operation in the duties devolving upon them.

Aberdeen Show, 1876.—I have further to report that the arrangements for the Aberdeen Show, so far as yet completed, are in a highly satisfactory state. The pre-

mium list and regulations, as prepared by the General Show Committee and approved of by the Directors, were submitted to a meeting of members held at Aberdeen on the 17th of December, and again to a meeting of the Board, when premiums were agreed to to the amount of L.2,440, or L.840 above what was offered at Aberdeen in 1868. That list is now upon the table. The competition for the premium of L.50, offered by the Society for the best thoroughbred stallion to serve in the district of the Show, will take place in the market stance, King Street, Aberdeen, on Friday the 4th day of February. All entries must be made on or before the morning of the Show, with Mr Alexander Yeats, Secretary of the Royal Northern Society, 89 Union Street, Aberdeen. The only matter of regret I have to bring before you is in regard to the date of the Show of the Royal Agricultural Society of England, which has this year been fixed to be held at Birmingham from the 19th to the 24th July, both inclusive ; while the Aberdeen Show takes place from the 25th to the 28th July, both inclusive. The matter was carefully considered by the Board on the 5th of January, when it was resolved to adhere to the date fixed for the Aberdeen Show, believing that any alteration to a later date would not be advisable. I may add that if the Show is held the week following it will clash with the Irish and Yorkshire shows."

Edinburgh Show, 1877.—"I have finally to report that the Directors some time ago received applications, numerously signed, from members and others in the three Lothians and in the city of Edinburgh, requesting the Society to hold the Show for 1877 at Edinburgh. The Directors have pleasure in recommending for the approval of this meeting that the Show for that year should be held in Edinburgh. The classes of stock for which premiums will afterwards be offered were named by the General Show Committee. The list was subsequently laid before a meeting of members, and after some emendations received the approval of the Board at its meeting on the 5th of this month. That list as adjusted I have now to lay before you ; and beg to move that the recommendations of the Directors be adopted, and that it be remitted to them to make the usual arrangements. I may add that the Directors received a circular from the Mayor of Carlisle proposing that the English and our Show should be held together at Carlisle in 1877, but after careful consideration the Directors deemed it inexpedient to entertain the proposal."

The reports were adopted.

District Competitions.—Mr A. Campbell Swinton gave in the report in regard to district competitions. It stated that the money premiums awarded in 1875 amounted to L.452, besides 10 silver, 246 medium, and 182 plough medals ; and that the premiums to be offered in 1876 consisted of:—Four districts for cattle at L.20, one silver and three medium silver medals each, L.89, 10s. ; three districts for cattle (intermediate year), one silver and three medium silver medals each, L.7, 2s. 6d. ; six districts for stallions at L.25 each, L.150 ; four districts for mares at L.8 and one medium silver medal each, L.34, 2s. ; five districts for colts and fillies at L.19 and four medium silver medals each, L.105, 10s. ; six districts for sheep at L.18, one silver and four medium silver medals each, L.125, 8s. ; six districts for sheep (in intermediate year), one silver and four medium silver medals each, L.17, 8s. ; special grants—Edinburgh Christmas Club (L.50 and medium gold medal), L.56, 2s. ; Glasgow Agricultural Society, for thoroughbred stallion, L.50 ; Ayrshire Association, L.20 ; Unst Society, L.10 ; Westray Society, L.3—L.89, 2s. ; medium silver medals, sixty districts, L.100 ; ploughing competitions, L.50—making the total amount offered L.818, 2s. 6d.

In reply to a question by the Hon. George Waldegrave Leslie in regard to encouragement to be given to get the best breed of Clydesdale horses,

Mr Campbell Swinton said that the committee would be glad to receive suggestions in regard to the carrying out of the report.

Cottage Competitions.—Mr Maxwell Inglis of Loganbank gave in the report in regard to competitions for cottages and gardens. It was as follows :—"*Awards in* 1875.—The money premiums awarded amount to L.16, 10s., besides 16 medium silver medals and 18 minor silver medals, making the total amount expended L.30, 6s. *Premiums to be offered in* 1876.—The Directors suggested the following grants for 1876—viz., 7 parishes at L.3 and 4 medals each, L.29, 8s. ; 10 districts at 2 medium silver medals each, L.10, 10s. ; 2 gold medals for improving existing cottages and building new cottages, L.20—making the total amount offered, L.59, 18s."

The report was adopted.

The Transactions of the Society.—Mr Howatson of Dornel brought forward a motion of which he had given notice with regard to the issue of the Transactions. He stated that the whole of the members, especially those who had joined the Society since 1866, joined it on the distinct understanding that they would be supplied with these Transactions. He moved—"That the recommendation of the Directors in their report on the chemical department and agricultural education to the General Meeting in January last, relating to the discontinuance of the free issue of the Transactions to the members, be rescinded, and that the gratis issue to members on application be continued."

Mr MARTIN, yr. of Auchendenan, seconded the motion. He thought that if they were able to give L.5,000 for a new hall, they could continue to give the Transactions free to members.

Provost DUNCAN, Rothesay, thought the Transactions should be sent to all members of the Society who paid their subscription. There were many of the poorer and more backward members who would not think of sending for the volume, and would yet be glad to get it. It would be much valued in the country, where books were few enough, and so tend to popularise the Society, as well as to increase its resources.

Mr MILNE HOME of Wedderburn said that he agreed with his brother Directors on this question, although he had differed with them on other matters. The committee appointed to ascertain how the expenditure of the Society could be economised and the funds liberated for other purposes, found that there were L.431 a-year being spent on the Transactions, and they recommended that they should be reduced to L.200 or L.250. The Directors approved of the report, and submitted it to the General Meeting in January 1875, which also approved of it. Again, at the last General Meeting in June 1875, Mr Irvine of Drum stated that if no objection was taken the free distribution of these Transactions would cease from that time or shortly after. No objection was taken, so that they would require to proceed with considerable caution in a proposal to upset the opinion of the Directors and two General Meetings. Their object was to apply these funds to greater purpose—such as the establishment of experimental stations, bursaries for education, and other things—than the distribution of the Transactions, which contained no original papers, but merely reprints of essays which received premiums, and proceedings of the Society. If there was any value in these Transactions, those who got them should not grudge the 2s.6d. which they cost, especially when they saw that it put the Society in possession of L.250 additional income.

Mr M'LAGAN of Pumpherston, M.P., said that this was one of the few societies in the country that compelled its members to pay for a copy of their own Transactions. The societies of England and Scotland all distributed these gratuitously to their members, and he did not see that the members of the Highland and Agricultural Society of Scotland should be put to a disadvantage as compared with the members of the Royal Agricultural Society of England, and compelled to pay for their Transactions.

Colonel INNES of Learney pointed out that this was not a recommendation of the Directors that was dealt with. What they were really wanted to do was to rescind a resolution of last General Meeting. The Directors were by no means unanimous on the matter.

The Duke of BUCCLEUCH also called attention to the fact that there was an error in the motion. They might rescind their own decision on any matter, but they could not rescind a recommendation of the Directors or a committee.

The resolution was then put as follows, and carried by a large majority:—"That the resolution of the General Meeting in January last, relating to the discontinuance of the free issue of the Transactions to members, be rescinded, and that the gratis issue to members on application be continued."

The SECRETARY said that in consequence of the decision of this meeting he had to intimate—(1) That the volume will be sent to all members who hitherto have received it without further application; (2) That it will be sent to those who have for the first time made application by returning the recent circular; (3) That those members who have paid for the volume will immediately receive back the amount in postage stamps; (4) That all members who have never made application for the Transactions at all will receive the volume if they apply before 1st February; (5) That back numbers or volumes will be supplied to members on application to Messrs William Blackwood & Sons, 45 George Street, Edinburgh, at the following rates:—Fourth Series, 1866–71, six numbers, 4s. each; 1872–75, four volumes, 5s. each.

Mr IRVINE of Drum reported that volume viii. of the Transactions was partly in type, and that as many of the prize essays which will be announced to-day will be included as, with the proceedings and premium list for 1876, will make the volume the usual size.

THE CHEMICAL DEPARTMENT.—Mr MACKENZIE of Portmore, in the absence of Sir Thomas Hepburn, read the report of the Directors on this department, which is given in the Report of the Directors' Meeting of 5th January 1866. He remarked that a great deal of acerbity had been introduced into this matter, and much had been said out of doors about the propriety or impropriety of the steps they were now taking. He begged to assure the meeting that whatever the Society, after mature deliberation, entrusted to the Directors, they would loyally carry out; and it was only after anxious consideration that they had come before the Society and again asked it to reconsider its decision. He concluded by moving that the meeting authorise the Directors to organise such experimental stations as they may find practicable with the funds at their disposal, and appoint a properly qualified chemist as an officer of the Society.

Professor BALFOUR seconded the motion. They could not get on well, he said,

unless they followed this arrangement, and he believed that they would get an efficient chemist for the purpose at the sum they proposed.

Mr GREIG, Harvieston, doubted the competency of the committee bringing up this question again, seeing that it was not remitted to them at last meeting.

A MEMBER—The whole matter was remitted to them.

The Hon. GEORGE WALDEGRAVE LESLIE—Will this chemist have to give his whole time to the Society, or will he be allowed to do other work?

Mr BINNING HOME of Argaty asked how these experimental stations were to be conducted? Were they to be conducted by individuals who were to undertake farms under the direction of the chemist, and have the results reported to him; or was it the Society that was to undertake the working of these experimental farms? He could not see how it was possible that such experiments could be worked to any extent without a monstrous outlay. Such experiments made under the auspices of the Society would no doubt be a great blessing to the country at large, but if they were confined to small patches in given places he could see no benefit that would accrue.

Mr MACKENZIE—These are matters of detail that can be more properly dealt with after we have got the machinery.

The Hon. GEORGE WALDEGRAVE LESLIE—I should like to get an answer to my question—Whether the chemist would give his whole time to the Society, as Dr Voelcker gave to the Royal English Agricultural Society?

Mr MACKENZIE—We think that should be so.

Colonel INNES of Learney said that a good deal of the difference of opinion that had for several years prevented their coming to a conclusion on this matter had arisen from the want of a distinct understanding as to what the duties of this person who was called a scientific chemist should be. He pointed out, from the facilities now existing for obtaining analyses, that there was not the same necessity now as there was in the earlier period of scientific agricultural chemistry for the Society engaging a scientific chemist to analyse manures to protect farmers from imposition; and then went on to ask, What is the benefit the Directors expect to have from a chemist? They had an example of what had taken place in an association formed in the county of Aberdeen. They had engaged a scientific man whose duties were to organise and superintend the conducting of these experimental stations, and afterwards, by analyses and scientific investigation, to bring out the results. That was, he understood, what the Directors were to engage this official to do. The question therefore was, whether his duties should be limited to these functions or not? If the Highland and Agricultural Society established experimental stations, to be conducted directly by their own officials, they would fall very far short of what was necessary if they did not also take steps to generalise and compare the results they obtained themselves with the experiments obtained by other associations. Differences would arise from circumstances of climate and of soil, and the various observations would exhibit very considerable variation. If no means were taken by a previous arrangement to get at the average results of these different experiments, they would, instead of arriving at any useful conclusion, only obscure and mystify the results. It might be necessary for them to take the function of a great national society, and bring into one common focus the experiments instituted in all parts of the country. That would be quite sufficient employment for any one man. If they offered to any competent man of high attainments such employment as that, and gave him a certainty that it would last for a certain period of years, he had no doubt a comparatively small direct payment of salary would secure the services of the man they wanted, because the conduct of such experiments on such a large scale, and the character he would establish by obtaining large and useful results, would of itself be a great reward. He moved—"That the meeting approve of the report of the Directors, subject to the condition that the engagement of a chemist shall be for a limited period, and shall embrace the entire services of the person employed, and that this employment shall be limited to the organisation and management of the stations established by the Highland and Agricultural Society, and to the arrangements which may be necessary to make with other associations, and the necessary analyses and scientific investigations required; and further recommend that the application of the Aberdeenshire Association for aid may receive early and favourable consideration."

Mr WILSON, Edington Mains, said that they were now discussing this question under different conditions from what were before them at last meeting. Some who opposed the proposal then had the idea that they were to go on the old footing of appointing a chemist at a salary of L.300 a-year, who was only to devote a certain portion of his time to the services of the Society, and was to have very much at his own choice the time he was to give them. They tried that system for a whole generation, and the result was literally nothing. He had no doubt that a chemist of the Society would furnish to the individuals who sent him samples a reliable report; but there were local associations employing chemists, who not only afforded the individuals applying to them the result of their analyses, but sent a confidential communication to every

member of the association making them aware of the whole facts; and when any fraudulent sales were reported among forty or fifty farmers in a locality, it made the district too hot for the scoundrels, who had to betake themselves elsewhere. The Highland Society could not do more. The Directors had hitherto shown very prudent caution in doing what the English Society did—publishing through the papers the number of fraudulent transactions that came to their knowledge. They were like the canny Scots, trying to keep themselves on the windy side of the law. He could not much blame them for that. But there was the work being done in the important districts of Scotland by these associations, and it would be a work of supererogation altogether for the Highland Society to appoint a man for what could be done otherwise. It seemed to him that the proposal put before them was self-contradictory. They were, as he understood, to set apart L.700 a-year for these joint purposes; and then, in administering the L.700, they began by appointing a chemist at L.300 a-year, and another functionary, whose duties he did not well understand—a practical agricultural inspector—who was to get L.150, and another L.50 for travelling expenses. There was L.500 of the sum gone. It reminded one of Falstaff's intolerable deal of sack to a halfpennyworth of bread. To eat up L.500 in salaries, and start experimental stations with L.200 a-year, was ludicrous altogether. Mr Lawes of Rothamstead had been devoting for some time past L.2,000 a-year on these experiments. Fancy the idea of the Highland Society gravely proposing to go into these experimental stations, and expending on them the magnificent sum of L.200 a-year! He thought they had better employ the whole L.700 in subsidising those Aberdeenshire friends who were setting themselves to work on their own resources, and apparently conducting them with prudence and energy, as was their wont. The proposal to squander two-thirds of the money to be devoted for this purpose in the payment of salaries appeared to him futile. He would far rather see the Highland Society letting its funds accumulate for some years, and then, when they took up the matter, take it up to good purpose. The present proposal for going into the thing would seem to be a practical embodiment of "how not to do it." It would be something worthy of the Highland Society if they were to take a decided step in advance with regard to experimental stations. Much of their proceedings as practical farmers were taken in the dark. When they spent large sums of money on manures there was no man who knew with any confidence what the results of these were to be; and it would be most important if they could proceed with anything of the confidence which arose from an assured basis of fact. It was only by experiments proceeding in the way indicated by those experimental stations that these matters could be cleared up. What the Society had hitherto been doing in the way of awarding premiums for stock and other things were well enough in their way, but they really had had no connection with the progress of agriculture. Reference was often made to the progress of agriculture, and it was attributed to the Highland Society. Progress would have gone on although the Highland Society had never existed. He admitted that the Highland Society had done well in regard to its annual show, which was important as a means of education. Young farmers could go there and see in one day a representation of the live stock in the county, and of implements and machines in use which they could not afford time or money to see for themselves in detail. But as to its having to do with the improvement of stock, to that he demurred altogether. He questioned whether it had not done a good deal of damage to the breeding of stock, and whether the excessive over-feeding of animals had not had a very serious effect as to the improving of some breeds. He concluded by moving that the resolution at the meeting of the Society in June last be adhered to.

Mr Milne Home, in seconding the amendment, said that there were several points of complete agreement between the general body of the Society and the Directors. The only point in dispute was whether or not the Directors should be authorised to appoint a chemist for life—a permanent chemist, as it was called in the report—or left free to choose a chemist for any particular duty for which the chemist should be required. He felt surprised that the Directors should have referred to the experience of the last twenty-eight years. Any one who looked back on what had happened during that time should have avoided proposing such a scheme again. Dr Anderson was an excellent chemist and excellent man; but, according to his own admission, his field experiments were an entire failure. He was so occupied with work in the laboratory that he had not time to attend to them. Then, for the last three years they had to give him L.900 or L.1,000, for which the Society got no value. They appointed another chemist, Mr Dewar. What service did he render to the Society, except come there twice a year and read a report occupying five minutes? They had paid L.150 for these two reports. He did not know what other service Mr Dewar had rendered. As to the Society established in Aberdeenshire and the stations appointed there, he was at one time most anxious that this national Society should have the prestige of starting these stations. It was, he proceeded, a very remarkable fact that the Directors had organised a scheme for their stations, and would it be believed that during the whole of that time they never consulted Mr Dewar at all? Let them look

at what had been done by their friends in Aberdeenshire. They did not employ a chemist in the first place, but they organised their five stations, and that being done they then set to work to get a chemist to make analyses of manures and soil. Then why appoint a chemist for life? Let the Directors choose the best chemist they could get; but instead of giving a salary, they might give fifty guineas, which would be enough to get all that was required. He had received a letter from the Marquis of Huntly, who at one time was anxious for the appointment of a permanent chemist, but who was now of a different opinion. That was the view of a noble Lord whose opinion was worth attending to, as he had given the matter great attention. He himself had consulted Mr Lawes of Rothamstead and a gentleman at the head of agriculture in Ireland, both of whom thought the appointment of a permanent chemist was most injudicious.

The Duke of Buccleuch said he found from looking at the charter that they could not do such a thing as appoint a permanent official. They would have to submit for appointment annually the name of the chemist the same as that of the secretary.

Mr Milne Home said he knew it was not competent to elect any officer for more than one year. But it was understood that a promise should be held out that the appointment would be renewed.

Mr Roughead, Haddington, said he thought at one time that a permanent chemist should be appointed, but from what he had heard his views had been a little altered. He thought that before setting the experimental farms on foot, a deputation should go to Germany to see the same kind of farms there. In Pomerania, he believed, they had got a large profit from the experimental farms

Mr Ferguson of Kinmundy seconded the motion of Colonel Innes.

Mr Smith, Whittingham, said he thought that they should postpone the matter, until they were able to go on with the business in an efficient manner.

Provost Duncan, Rothesay, said he thought it would be wrong if the Society were to stop short of the modest proposal of the Directors. The real fact was that the proposal of the Directors was the only common-sense view of the subject that had been brought forward.

Sir Thomas Gladstone said he would suggest an addition to the motion, to the effect that the appointment of the chemist should be provisional and experimental, in order to find out how it worked.

Colonel Innes said he was prepared to adopt the suggestion of Sir Thomas Gladstone, to the effect that the appointment of the chemist should be provisional.

Mr Wilson said that in that case he was quite willing to withdraw his amendment, and give his support to the proposal of Colonel Innes.

Mr Mackenzie withdrew his motion.

The motion of Colonel Innes, as amended, with the addition of the word "provisional," was then unanimously agreed to.

Agricultural Education.—Mr Hunter of Thurston reported that, in accordance with the bye-laws passed at the Annual General Meeting in January last, and confirmed by the General Meeting in June, respecting the bursaries established by the Society, the first examination was held on the 16th November last, when Mr Alex. Sutherland, Rampyards, Watten, Golspie, from Gersay Public School, passed for a bursary of £20. By the regulations, Mr Sutherland requires to take the classes at the Edinburgh University necessary to qualify for the Society's certificate or diploma. Mr Hunter added that at the General Meeting in June 1874 the Society authorised a memorial to be addressed to the Committee of Council on Education, and that an answer has been received from my Lords acceding to the Society's suggestion that the science of agriculture should be added to the list of subjects towards instruction in which aid is granted by the Science and Art Department, on the understanding that it is an experiment, and that the continuance of agriculture on the list of sciences aided by that department will depend on the number of candidates for grants in that subject. A syllabus, it is stated, will shortly be issued.

The report was adopted.

Veterinary Department.—Captain Tod of Howden reported that the preliminary examination in botany, chemistry, and anatomy for the Society's veterinary certificate took place on the 13th and 14th July, when 32 students entered their names for examination, viz., 13 from the Edinburgh Veterinary College, 16 from the New Veterinary College, Edinburgh, and 3 from the Glasgow Veterinary College, and that 16 had obtained the certificate.

Agricultural Reports.—Mr Irvine of Drum reported the premiums awarded for reports on the science and practice of agriculture, and those offered for competition in 1876, which were approved of.

Forestry Department.—Dr Cleghorn, in the absence of Professor Balfour, reported the awards in the Forestry Department, as well as those offered for competition in 1876, which were approved of.

Ordnance Survey.—The Secretary, in the absence of Mr Dundas of Arniston

reported that, pursuant to the instructions from the last General Meeting, a deputation from the Society waited upon Lord Henry Lennox, M.P., the First Commissioner of Works, at the House of Commons, for the purpose of presenting a memorial and asking for a Government grant to complete the unfinished survey of Scotland. (An extract from the memorial is given in the report of the General Meeting, 16th June 1875, and the answer will be found in the report of the Directors' Meeting, 3d November 1875.)

Foot-and-mouth Disease.—Captain Tod of Howden then read the following memorial to Government on the subject of the foot-and-mouth disease:—"Unto the Right Honourable the Lords of Her Majesty's Most Honourable Privy Council, the Memorial of the Highland and Agricultural Society of Scotland, incorporated by royal charter, in General Meeting assembled, showeth, That your Memorialists, as representing the landed proprietors and tenant-farmers of Scotland, have for many years taken an active lead in all veterinary matters connected with Scotland, and have a deep interest in whatever conduces to the preservation from disease of the farm live-stock of the kingdom, and have closely watched the operation of existing legislation in regard to foot-and mouth disease, the rapidly-increasing losses by which they observe with alarm. That your Memorialists have carefully considered the subject, and are of opinion that the present existing laws have proved insufficient to eradicate the disease, or prevent its spreading, and that there is a want of a proper system of organisation enforcing uniformity of action, whereby the present diversity of practice among local authorities in neighbouring towns and counties might be averted, and a more stringent, uniform, and regular system enforced. That your Memorialists are agreed, and fully believe, from evidence and experience, that foot-and-mouth disease is largely introduced by the importation of foreign cattle, and they are of opinion that all imported sheep and cattle should be either slaughtered at the port of debarkation or undergo such a period of quarantine as to prove them healthy, and thus prevent disease being spread by them. That your Memorialists would further call attention to the number of outbreaks of this disease amongst cattle brought from Ireland to Scotland, and would humbly suggest that a more complete inspection of steamboats carrying cattle and sheep be adopted, and a thorough cleansing and disinfecting insisted on. Your Memorialists therefore humbly pray your Lordships to take this most important subject into careful consideration, and to issue such orders or take such measures as may be expedient for remedying and extirpating this growing evil.—Signed in name and by authority of a General Meeting of the Society, held at Edinburgh on the 19th day of January 1876. (Signed) Glasgow, chairman."

The Hon. G. Waldegrave Leslie said that as this was the last part of the proceedings of the day, he hoped that the Directors would press this subject strongly on the attention of the Government.

Principal Williams suggested that in the memorial it should be stated that the disease referred to was got wholly from abroad.

Mr Ferguson of Kinmundy said that in Aberdeenshire many cases of disease had occurred in which there had been no communication with animals from abroad.

Mr F. N. Menzies, Secretary, said that in framing the memorial he thought it better to treat these matters in general terms.

Mr Elliot, Laighwood, said that in Glasgow market, where the Irish animals were put in day by day, they caught the disease.

Mr Maxwell said he thought that active steps ought to be taken to have the ground cleaned into which the animals were brought.

The memorial was then adopted.

On the motion of the Hon. George Waldegrave Leslie, a vote of thanks was given to the Earl of Glasgow for presiding, and the meeting separated.

PREMIUMS AWARDED BY THE SOCIETY IN 1875-76.

I.—REPORTS, 1876.

AGRICULTURAL.

1. James Macdonald, Special Reporter for the "Scotsman," Aberdeen, for a Report on the Agriculture of the County of Fife, ... L.30 0 0
2. Richard Henderson, Crosslanes, York, for the best Text Book on Agriculture as a branch of Physical Science, ... 25 0 0
3. George Armatage, The Bank, Hertford, for a Report on the Causes of the Septic, Anthrax, or Carbuncular Fevers amongst Horses, Cattle, Sheep, and Pigs, . 15 0 0
4. Thomas Farrall, Aspatria, Carlisle, for a Report on the Ayrshire Breed of Cattle, Plate, value, 10 0 0
5. George Armatage, The Bank, Hertford, for a Report on Inoculation as a means for the Prevention of Pleuro-Pneumonia, ... 10 0 0
6. Gilbert Murray, Elvaston Estate Office, Derby, for a Report on the Management of Grass Lands in England. . . . . Plate, value, 10 0 0
7. David Robie, Lansdowne Terrace, Bedford, for a Report on the Management of Grass Lands in England, ... 10 0 0
8. Gilbert Murray, Elvaston Estate Office, Derby, for an Improved Cattle Truck, Plate, value, 10 0 0
9. Mrs Paterson, now Roger, 38 Union Street, Dundee, for a Report on how to Raise and Cultivate the Potato, ... Plate, value, 5 0 0

FORESTRY.

10. John Nisbet, Junior Assistant Conservator of Forests, British Burma, for a Report on the Value, for economical purposes, of the Corsican Fir, Medium Gold Medal, 6 2 0
11. Robert Hutchison of Carlowrie, Kirkliston, for a Report on the Pinus Pinaster or Cluster Pine, ... Plate, value, 5 0 0
12. Robert Hutchison of Carlowrie, Kirkliston, for a Report on the Effects Produced on the various species of Forest Trees by Smoke from Public Works, Plate, value, 5 0 0
13. Christopher Young Michie, Forester, Cullen House, Cullen, for a Report on Thinning Plantations, ... 5 0 0

L.146 2 0

II.—INVERNESS SHOW, 1874.

John Richardson, Brunton Place, Carlisle, for Grass Seed Dressing Machine Silver Medal, L.0 16 0

III.—GLASGOW SHOW, 1875.

Class I.—CATTLE.

SHORTHORN.

First Prize Bulls at former Shows.—Exhibited for Medium Gold Medal.

Inverness, 1874, when the property of the present Exhibitor—Robert Bruce, Newton of Struthers, Forres, "Lord Irwin" (29,123), . . L.5 0 0

Section 1. BULLS calved before 1st January 1873.

1. A. H. Browne, Doxford, Chathill, Northumberland, "Duke of Aosta" (28,356) . L.25 0 0
2. Walter Scott, Glendronach, Huntly, "Jeweller," 15 0 0
3. Alexander Buchanan, Whitehouse, Stirling, "Heather-bred Lad," . . 10 0 0

Sir Thomas Buchan Hepburn, of Smeaton, Bart, Prestonkirk, "Baron Hepburn," (30,458), ... Reserve Number,

Breeder of Best Bull—T. H. Hutchinson, Manor House, Catterick, Silver Medal, 0 16 0

Section 2. BULLS calved after 1st January 1873.

1. A. H. Browne, Doxford, Chathill, Northumberland, "Rosario," . . . 25 0 0
2. W. and H. Walton, Appletree Shield, West Allendale, Langley Mills, "Squire Marshall," 15 0 0
3. W. S. Marr, Upper Mill, Tarves, "Royal Prince," 10 0 0
4. James Merson, Craigwillie, Huntly, "William M'Combie," Reserve Number,

Carry forward, L.105 16 0

	Brought forward,	L.105	16 0

SECTION 3. BULLS calved after 1st January 1874.

1.	A. H. Browne, Doxford, Chathill, Northumberland, "Pioneer,"	15	0 0
2.	James Bruce, Burnside, Fochabers, "Earl of March,"	10	0 0
3.	George Shiels, Horseupcleuch, Dunse, "Scottish Errant,"	5	0 0
4.	The Duke of Richmond, K.G., Gordon Castle, Fochabers, "Norseman," Reserve Number,		

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

	Inverness, 1874, when the property of the present Exhibitor—Robert Bruce, Newton of Struthers, Forres, "Fair Tyne,"	5	0 0

SECTION 4. COWS of any Age.

1.	T. H. Hutchinson, Manor House, Catterick, "Lady Playful,"	20	0 0
2.	Sir William Stirling-Maxwell of Keir, Bart., M.P., Dunblane, "Princess Henrietta,"	10	0 0
3.	T. H. Hutchinson, Manor House, Catterick, "Dairy Girl,"	5	0 0
4.	James Beattie, Newbie House, Annan, "Cherry Queen," Reserve Number,		

SECTION 5. HEIFERS calved after 1st January 1873.

1.	T. H. Hutchinson, Manor House, Catterick, "Lady Alicia,"	15	0 0
2.	James Tweedie, Deuchrie, Prestonkirk, "Red Tulip,"	10	0 0
3.	Wm. S. Marr, Upper Mill, Tarves, "Mary Anne 10th,"	5	0 0
4.	John Law, New Keig, Whitehouse, Aberdeen, "Dorothy," Reserve Number,		

SECTION 6. HEIFERS calved after 1st January 1874.

1.	James Lawrence, Thornhill, Forres, "Ida,"	10	0 0
2.	William S. Marr, Upper Mill, Tarves, "Emma 3d,"	8	0 0
3.	Wm. A. Mitchell, Auchnagathle, Whitehouse, Aberdeen, "Young Hawthorn,	4	0 0
4.	James Tweedie, Deuchrie, Prestonkirk, "Grand Cherry," Reserve Number,		

POLLED ANGUS OR ABERDEEN.

First Prize Bulls at former Shows—Exhibited for Medium Gold Medal.

	Inverness, 1874, when the property of Alexander Bowie, Mains of Kelly, Arbroath—The Earl of Fife, K.T., Duff House, Banff, "Gainsborough" (596),	6	2 0

SECTION 7. BULLS calved before 1st January 1873.

1.	The Marquis of Huntly, Aboyne Castle, Aberdeen, "Duke of Perth" (357),	20	0 0
2.	Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Scotsman" (474),	10	0 0
	Breeder of best Bull—The late George Brown, Westertown, Fochabers Silver Medal,	0	16 0

SECTION 8. BULLS calved after 1st January 1873.

1.	The Earl of Fife, K.T., Duff House, Banff, "Young Viscount,"	20	0 0
2.	Sir Thomas Gladstone of Fasque, Bart., Laurencekirk, "Adrian 2d" (622),	10	0 0
3.	William M'Combie, of Easter Skene, Skene, Aberdeenshire, "Bachelor" (690),	5	0 0
4.	William James Tayler, Rothiemay House, Huntly, "Canmore" (626), Reserved Number,		

SECTION 9. BULLS calved after 1st January 1874.

1.	The Earl of Fife, K.T., Duff House, Banff, "St Clair,"	10	0 0
2.	Wm. James Tayler, Rothiemay House, Huntly, "Sir Roger" (702),	5	0 0
3.	James Law, East Mains, Broxburn, "Robin Hood" (946),	3	0 0
4.	Cecil F. Gwyer, Biallid, Kingussie, "Juniper" (742), Reserve Number,		

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

	Stirling, 1873, when the property of the present Exhibitor—Sir George Macpherson Grant of Ballindalloch, Bart., Ballindalloch, "Bertha" (980). Plate value	5	0 0
	Inverness, 1874, when the property of the present Exhibitor—William James Tayler, Rothiemay House, Huntly, "Kate 2d" (1482),	6	2 0

SECTION 10. COWS of any Age.

1.	The Marquis of Huntly, Aboyne Castle, Aberdeen, "Dora" (1282)	20	0 0
2.	The Earl of Fife, K.T., Duff House, Banff, "Corriemulzie" (1701),	10	0 0
3.	Do. do. "Innes" (1934),	5	0 0
4.	Do. do. "Heather Blossom" (1703), Reserve Number,		

	Carry forward,	L.383	16 0

Brought forward, L.383 16 0

SECTION 11. HEIFERS calved after 1st January 1873.

1. William M'Combie, of Easter Skene, Skene, Aberdeenshire, "Blackberry" (1813), 10 0 0
2. Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Ethel" (1415), 6 0 0
3. The Earl of Fife, K.T., Duff House, Banff, "Pluscarden" (1937) 4 0 0
4. Do. do. "Edith" Reserve Number,

SECTION 12. HEIFERS calved after 1st January 1874.

1. Sir Thomas Gladstone of Fasque, Bart., Laurencekirk, "Emilie," 8 0 0
2. William M'Combie, of Easter Skene, Skene, Aberdeenshire, "Lady Anne," 5 0 0
3. James Law, East Mains, Broxburn, "Nancy of East Mains" (2314), 3 0 0
4. The Earl of Fife, K.T., Duff House, Banff, "Signet 2d," Reserve Number,

GALLOWAY.

First Prize Bulls at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when the property of the present Exhibitor—James Cunningham, Tarbreoch, Dalbeattie, "Pretender" (617), 5 0 0

Inverness, 1874, when the property of the present Exhibitor—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Black Prince of Drumlanrig" (546) 6 2 0

SECTION 13. BULLS calved before 1st January 1873.

1. James Cunningham, Tarbreoch, Dalbeattie, "Cunningham" (824), 20 0 0
2. George Graham, Oakbank, Longtown, "Forest King" (553), 10 0 0

Breeder of best Bull—James Cunningham, Tarbreoch, Silver Medal, 0 16 0

SECTION 14. BULLS calved after 1st January 1873.

1. Robert Rae, Meikle Cocklicks, Dalbeattie, "Oliver," 20 0 0
2. James Graham, Parcelstown, Longtown, "Sim of Whitram" (562), 10 0 0
3. Thomas Biggar, Chapelton, Dalbeattie, "Dandie Dinmont" (813), 5 0 0

SECTION 15. BULLS calved after 1st January 1874.

1. James Jardine Paterson of Balgray, Lockerbie, "Bob," 10 0 0
2. Robert Jardine of Castlemilk, Lockerbie, "Burnswark," 5 0 0
3. Andrew Jardine of Lanrick Castle, Stirling, "Black Douglas" (668), 3 0 0

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when the property of the present Exhibitor—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Louisa 2d" (1379), 6 2 0

Inverness, 1874, when the property of the present Exhibitor—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Juno of Drumlanrig" (1641), 6 2 0

SECTION 16. COWS of any Age.

1. James Cunningham, Tarbreoch, Dalbeattie, "Maid Marion 4th" (1668), 20 0 0
2. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Melantho" (1643), 10 0 0
3. Do. do. do. "Ilythia" (1307), 5 0 0
4. James Cunningham, Tarbreoch, Dalbeattie, "Bride of Brampton" (2188), Reserve Number,

SECTION 17. HEIFERS calved after 1st January 1873.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Aurora" (1661), 10 0 0
2. Do. do. do. "Antigone" (1663), 6 0 0
3. Robert Jardine of Castlemilk, Lockerbie, "Rosy," 4 0 0
4. The Duke of Buccleuch and Queensberry, "Amy of Drumlanrig," (1902) Reserve Number,

SECTION 18. HEIFERS calved after 1st January 1874.

1. The Duke of Buccleuch and Queensberry, "Beauty of Drumlanrig" (1755), 8 0 0
2. Do. do. "Bridesmaid," 5 0 0
3. James Cunningham, Tarbreoch, Dalbeattie, "Little Emily," 3 0 0
4. The Duke of Buccleuch and Queensberry, "Britomartis" (1754), Reserve Number,

Carry forward, L.5 77 18 0

Brought forward, L.577 18 0

AYRSHIRE.

First Prize Bulls at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when the property of Thomas Ballantine, Netherton, East Kilbride—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "White Butterfly," 6 2 0

Inverness, 1874, when the property of the present Exhibitor—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Statesman," . . . 6 2 0

SECTION 19. BULLS calved before 1st January 1873.

1. William Smith, Chanlockfoot, Penpont, Dumfries-shire, "The Shah," . . 20 0 0
2. William Weir, Inches, Larbert, "Jamie," 10 0 0
3. Robert Wardrop, Garlaff, Cumnock, "Champion," 5 0 0
4. The Duke of Buccleuch and Queensberry, "The Earl," 3 0 0

Breeder of Best Bull—Hugh Drummond, Craighead, . . Silver Medal. 0 16 0

SECTION 20. BULLS calved after 1st January 1873.

1. Robert Gillespie, Boyleston, Barrhead, "Scottish Chief," . . . 20 0 0
2. John Fleming, Woodside, Rutherglen, "Charlie," 10 0 0
3. William Gilmour, Kells of Southwick, Dumfries, "Prince Charlie," . . 5 0 0
4. Mrs Douglas, Green, Kilmalcolm, "Kerr," 3 0 0

SECTION 21. BULLS calved after 1st January 1874.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Sir Walter," 10 0 0
2. John Meikle, Seafield, Bathgate, "The Prince," 5 0 0
3. Thomas Cochrane, Laigh Cleughearn, East Kilbride, ... 3 0 0
4. Wm. Hunter, Craighead, Abington, "Chieftain," . . . 2 0 0

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when in milk, and the property of the present Exhibitor—Robert Wilson, Forehouse, Kilbarchan, "Hornie," 5 0 0

Inverness, 1724, when in milk, and the property of the present Exhibitor—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Dewdrop," . 6 2 0

SECTION 22. COWS in Milk, calved before 1st January 1872.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Ruby," 20 0 0
2. Robert Wilson, Forehouse, Kilbarchan, "Jaapston," 10 0 0
3. Alexander Graham, Blackwater, Kilmalcolm, "Dubbs," . . . 5 0 0
4. William Edmond, Hillhead of Catter, Croftamie, Drymen, "Red Beauty," . 3 0 0

SECTION 23. COWS in Milk, calved after 1st January 1872.

1. John Meikle, Seafield, Bathgate, "Lucy," 20 0 0
2. Mrs Douglas, Green, Kilmalcolm, "Brockie," 10 0 0
3. John Martin, Ardnahoe, Rothesay, "Rose," 5 0 0
4. R. Wilson, Forehouse, Kilbarchan, "Wilson," 3 0 0

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

Inverness, 1874, when in Calf, and the property of the present Exhibitor—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Modesty," . 6 2 0

SECTION 24. COWS in Calf of any Age, or HEIFERS in Calf, calved before 1st January 1873.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Diamond," 15 0 0
2. Do. do. "British Queen," . . 10 0 0
3. A. R. Foulds of Clerkland, Stewarton, "Douglas," 5 0 0
6. James Eadie, Cambuslang, "Maggie," 3 0 0

SECTION 25. HEIFERS calved after 1st January 1873.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Charmer," 10 0 0
2. Do. do. "Princess," 6 0 0
3. James Burrell, Denovan Mains, Denny, "Lady Douglas," . . . 4 0 0
4. John Pollok, Blackhouse Mearns, Glasgow, "Langton Lass," . . . 2 0 0

Carry forward, L.835 2 0

Brought forward, L.835 2 0

SECTION 26. HEIFERS calved after 1st January 1874.

1. John Holm, Jaapston, Neilston, "Jessie," 8 0 0
2. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Gem," 5 0 0
3. John Meikle, Seafield, Bathgate, "Beauty," 3 0 0
4. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Cowslip," 2 0 0

HIGHLAND.

First Prize Bulls at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when the property of the present Exhibitor—Donald M'Intyre, Tighnablair, Comrie, "Gille Dubh," . . . . Plate, value, 5 0 0

SECTION 27. BULLS calved before 1st January 1872.

1. James Campbell, Ormaig, Kilmartin, "Gille Riabhach," . . . 20 0 0
2. Alexander S. Stevenson, Auchineilan Ford, Lochawe, "Bruce," . . . 10 0 0
3. The Earl of Seafield, Castle Grant, Grantown, "Crinan," . . . 5 0 0
4. Lord Aveland, Glenartney Forest, Comrie, "Dunmore,," Reserve Number,

Breeder of Best Bull—John Malcolm of Poltalloch, Lochgilphead, Silver Medal, . 0 16 0

SECTION 28. BULLS calved after 1st January 1872.

1. Donald M'Laren, Corrychrone, Callander, ... 20 0 0
2. John Stewart, Duntulm, Portree, "Rob Roy," 10 0 0
3. P. Sinclair, Upper Largie, Kilmartin, "Gregarach," 5 0 0
4. Campbell Macpherson Campbell, of Ballimore, Tigh-na-bruaich, "Royal George," Reserve Number.

SECTION 29. BULLS calved after 1st January 1873.

1. John Stewart, Bochastle, Callander, ... 10 0 0
2. Trustees of the late Robert Peter, Urlar, Aberfeldy, "Domhnall Ruadh," . 5 0 0
3. Donald M'Laren, Corrychrone, Callander, ... 3 0 0
4. Trustees of the late Robert Peter, Urlar, Aberfeldy, "Gille Buidhe," Reserve Number,

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when the property of the present Exhibitor—John Stewart, Bochastle, Callander, "Nodhar," 6 2 0

SECTION 30. COWS of any Age.

1. John Stewart, Bochastle, Callander, ... 15 0 0
2. John Stewart, Duntulm, Portree, "Guanach," 8 0 0
3. The Earl of Seafield, Castle Grant, Grantown, "Countess," . . 4 0 0
4. Do. do. "Freuchie," Reserve Number,

SECTION 31. HEIFERS calved after 1st January 1872.

1. John Stewart, Bochastle, Callender, ... 10 0 0
2. Donald M'Laren, Corrychrone, Callander, ... 5 0 0
3. The Earl of Seafield, Castle Grant, Grantown, "Countess," . . . 3 0 0
4. Campbell Macpherson Campbell of Ballimore, Tighnabruaich, "Example," Reserve Number,

SECTION 32. HEIFERS calved after 1st January 1873.

1. John Stewart, Duntulm, Portree, "Targeal Bheg," 8 0 0
2. John Stewart, Bochastle, Callander, ... 4 0 0
3. Donald M'Laren, Corrychrone, Callander, ... 2 0 0
4. The Earl of Breadalbane, Taymouth Castle, Aberfeldy, "Bell," Reserve Number,

FAT STOCK.

SECTION 33. SHORTHORN OXEN calved after 1st January 1872.

Charles Alexander, Easter Knowe, Stobo, ... 6 0 0

SECTION 34. SHORTHORN OXEN calved after 1st January 1873—No Entry.

SECTION 35. HIGHLAND OXEN calved after 1st January 1871.

1. G. S. Home Drummond of Blairdrummond, Stirling, ... 6 0 0
2. Charles Digby Jones, Kilchamaig, Whitehouse, Kintyre, . . . 3 0 0

Do. do . . . Reserve Number,

Carry forward, L.1027 0 0

Brought forward, L.1027 0 0

SECTION 36. HIGHLAND OXEN calved after 1st January 1872—No Entry.

SECTION 37. OXEN of any other Pure or Cross Breed calved after 1st January 1872,

1. Walter Scott, Glendronach, Huntly (Cross), ... 6 0 0
2. Robert Husband, Gellet, Dunfermline (Cross),, ... 3 0 0

SECTION 38. OXEN of any other Pure or Cross Breed calved after 1st January 1873.

Walter Scott, Glendronach, Huntly (Cross), ... 5 0 0

SECTION 39. CROSS-BRED HEIFERS calved after 1st January 1872—No Entry.

SECTION 40. CROSS-BRED HEIFERS calved aftor 1st January 1873—No Entry.

EXTRA CATTLE.

Highly commended.

United States Ox, belonging to John Bell and Sons, Glasgow, Silver Medal, 0 16 0
Do. do. do. . . Silver Medal, 0 16

Commended.

Alderney Heifer, belonging to T. L. Melville Cartwright, Melville House, Ladybank, ... Medium Silver Medal, 0 10 6
Do. do. do. . . Medium Silver Medal, 0 10 6
Canadian Ox, belonging to John Bell and Sons, Glasgow, Medium Silver Medal, 0 10 6
Do. do. do. . . Medium Silver Medal, 0 10 6

L.1044 14 0

CLASS II.—HORSES.

FOR AGRICULTURAL PURPOSES.

First Prize Stallions at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when the property of the present Exhibitor—Alexander Galbraith, Croy Cunningham, Killearn, "Topsman," . Plate, value, L.5 0 0

SECTION 1. STALLIONS foaled before 1st January 1872.

1. David Riddell. Kilbowie, Duntocher, "Time of Day," L.30 0 0
2. Samuel Clark, Manswrae, Bridge of Weir, "Young Clyde," . . . 20 0 0
3. Peter Ferguson, Renfrew, "Young Clansman," 10 0 0
4. Robert Brewster, Branchal, Kilmalcolm, "The Marquis," . . . 5 0 0
5. Sir Wm. Stirling-Maxwell of Keir, Bart., M.P., Dunblane, "Newstead," Reserve Number,

Breeder of best Stallion—John Craig, Genoch, Maybole, . Silver Medal, 0 16 0

SECTION 2. ENTIRE COLTS foaled after 1st January 1872.

1. Adam Smith, Stevenson Mains, Haddington, "The Warrior," . . . 20 0 0
2. David Riddell, Kilbowie, Duntocher, "Royal Prince," 15 0 0
3. Andrew Gemmell, Caplaw, Neilston, "Gleniffer," 10 0 0
4. David Riddell, Kilbowie, Duntocher, "Roving Boy," 5 0 0
5. William Wyllie, Fenwick, "Paragon," . . Reserve Number,

SECTION 3. ENTIRE COLTS foaled after 1st January 1873.

1. John Hendrie, Maryville, Glasgow, "Disraeli," 15 0 0
2. John Thomson, Blaiket, Crocketford, Dumfries, "Enterprise," . . . 8 0 0
3. David Riddell, Kilbowie, Duntocher, ... 4 0 0
4. Peter Crawford, Dumgoyack, Strathblane, "Gang Forward," . . . 2 0 0
5. Robert Brewster, Branchal, Kilmalcolm, "Non Such," Reserve Number,

SECTION 4. ENTIRE COLTS foaled after 1st January 1874.

1. Lawrence Drew, Merryton, Hamilton, ... 10 0 0
2. John M. Martin, Auchendennan Farm, Balloch, "Prince George Frederick," . 6 0 0
3. William M'Master, Challoch, Glenluce, "Victor," 4 0 0
4. David Riddell, Kilbowie, Duntocher, ... 2 0 0
5. John Thomson, Blaiket, Crocketford, Dumfries, "Sportsman," Reserve Number,

Carry forward, L.171 16 0

Brought forward, L.171 16 0

SECTION 5. MARES (with Foal at foot), foaled before 1st January 1872.

1. Lawrence Drew, Merryton, Hamilton, "Mary," 25 0 0
2. Alex. Buchanan, Garscadden Mains, New Kilpatrick, "Maggie," . . 15 0 0
3. James Nicol Fleming of Knockdon, Maybole, "Maggie," . . . 10 0 0
4. Adam Smith, Stevenson Mains, Haddington, "Rosy," 5 0 0
5. Lawrence Drew, Merryton, Hamilton, "Hackie," Reserve Number,

First Prize Mares at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when in foal, and the property of the present Exhibitor—Sir William Stirling-Maxwell of Keir, Bart., M.P., Dunblane, "Rose," . . 6 2 0

Inverness, 1874, when with foal at foot, and the property of the present Exhibitor—James Sutor, Collie, Orton, Fochabers, "Rose," . . . 6 2 0

SECTION 6. MARES (in foal) foaled before 1st January 1872.

1. James Gardner, Boghead Farm, Paisley, "Jess," 20 0 0
2. James Sutor, Collie, Orton, Fochabers, "Rose," 10 0 0
3. John Clarke, Spindlehowe, Uddingston, "Rose of Bute," . . . 5 0 0
4. Alexander Lang, Garneyland, Paisley, "Nancy," 3 0 0
5. John Murdoch, Hilton, Bishopbriggs, "Rosie," . . Reserve Number,

SECTION 7. FILLIES foaled after 1st January 1872.

1. Lawrence Drew, Merryton, Hamilton, ... 10 0 0
2. W. H. Hardie, Borrowstoun Mains, Linlithgow, "Ranée," . . . 5 0 0
3. James M'Nab, Glenochil, Menstrie, "Princess," 3 0 0
4. John Watson of Earnock, Hamilton, "Jean," 2 0 0
5. W. J. Houldsworth, Coltness House, Wishaw, "Marchioness of Bute," Reserve Number,

SECTION 8. FILLIES foaled after 1st January 1873.

1. Robert Frederick, Drumflower, Glenluce, "Young Mary," . . . 8 0 0
2. William Pollock, Low Mains, East Kilbride, "Princess of Kilbride," . . 4 0 0
3. James Nicol Fleming, of Knockdon, Maybole, "Jess," 2 0 0
4. David Riddell, Kilbowie, Duntocher, ... 1 0 0
5. Robert Murdoch, Hallside, Newton, Cambuslang, "Jess," Reserve Number,

SECTION 9. FILLIES foaled after 1st January 1874.

1. Robert Weir, Brownhill, Carnwath, "Darling," 6 0 0
2. James Cunningham, Tarbreoch, Dalbeattie, "Princess," . . . 4 0 0
3. Alexander Buchanan, Garscadden Mains, New Kilpatrick, "Jean," . . 2 0 0
4. William Craig, Buchley, Bishopbriggs, "Nancy," 1 0 0
5. John Anderson, Smithstown, Croy, Kilsyth, "Maggie," Reserve Number,

SECTION 10. DRAUGHT GELDINGS foaled before 1st January 1872.

1. Ralph Stark of Summerford, Camelon, Falkirk, "Marquis," . . . 8 0 0
2. Alex. Aitkenhead, Shaw Moss, Pollockshaws, "Tam," 4 0 0
3. James Walker, East Ann Street, Glasgow, "Peacock," 2 0 0
4. Ralph Stark of Summerford, Camelon, Falkirk, "Duke," Reserve Number,

SECTION 11. DRAUGHT GELDINGS foaled after 1st January 1872.

1. Walter Colquhoun, Kilmahew, Cardross, "Smiller." 6 0 0
2. James Wilson, Old Mill, New Cumnock, "Craigton," 3 0 0
3. James Harvey, Toward Farm, Greenock, "Bute," 1 0 0

SECTION 12. MARES or GELDINGS, not exceeding 15 hands, for Milk Carts of Heavy Draught.

1. Archibald Bulloch, Milliken, East Kilpatrick, "Tam," 10 0 0
2. John Hamilton, 60 Kirk Street, Calton, Glasgow, "Nell," . . . 5 0 0
3. Robert Cowan, Sauchenhall, Kirkintilloch, "Jessie," 3 0 0

SECTION 13. MARES or GELDINGS, not exceeding 14½ hands, for Milk Carts of Light Draught.

1. John Fleming, Woodside, Rutherglen, "Dickie," 10 0 0

Carry forward, L.377 0 0

Brought forward, L.377 0 0

HUNTERS AND ROADSTERS.

First Prize Mares at former Shows—Exhibited for Medium Gold Medal.

Stirling, 1873, when with Foal at foot and the property of the present Exhibitor—James Stewart, Heathfield, Irvine, "Miss Kelly," . . . 5 0 0

SECTION 14. BROOD MARES (with foal at foot), suitable for Field, foaled before 1st January 1871.

1. James Moffat, Kirklinton Park, Carlisle, "Lady Lyne," . . . 20 0 0
2. James Houldsworth, of Coltness, Wishaw, "Lady Derby," . . . 10 0 0
3. J. C. Wakefield, Eastwood Park, Thornliebank, "Maggie," . . . 5 0 0
4. Hugh Taylor, Kaimshill, Kilmarnock, "Maggie," . Reserve Number,

SECTION 15. YELD MARES or GELDINGS, suitable for Field (light weight), foaled before 1st January 1871.

1. Durham Kippen, of Busby, Glasgow, gelding, "Kilbride," . . . 20 0 0
2. George Jardine of Hallside, 111 Douglas Street, Glasgow, gelding, "Cairngorm," 10 0 0
3. Lieut.-Col. Carrick Buchanan of Drumpellier, Coatbridge, gelding, . . 5 0 0
4. William C. Branford, Veterinary College, Edinburgh, mare, "Acherner 2d," Reserve Number,

SECTION 16. YELD MARES or GELDINGS, suitable for Field (heavy weight), foaled before 1st January 1871.

1. John Hendrie, Maryville, 82 Regent Street, Glasgow, gelding, "Bridegroom," . 20 0 0
2. George Jardine of Hallside, 111 Douglas Street, Glasgow, gelding, "Dalton," . 10 0 0
3. Thomas M'Dougal, Eskvale, Penicuik, gelding, "Rafter," . . . 5 0 0
4. A. F. Williamson, Standingstones, Dyce, Aberdeen, gelding, "Major," Reserve Number,

SECTION 17. FILLIES or GELDINGS, suitable for Field, foaled after 1st January 1871.

1. Walter Bartholomew, Auchtertool Distillery, Kirkcaldy, gelding, "Rufus," . 15 0 0
2. Lieut.-Col. Carrick Buchanan of Drumpellier, Coatbridge, gelding, "Royalist," . 8 0 0
3. Captain Lyon, R.N., Kirkmichael, Dumfries, gelding, "Clown," . . 4 0 0
4. George Williamson, Balkaithey, St Andrews, filly, "Bridget," Reserve Number.

SECTION 18. FILLIES or GELDINGS, suitable for Field, foaled after 1st January 1872.

1. James Moffat, Kirklinton Park, Carlisle, gelding, "The Boy," . . . 10 0 0
2. Alex. Lang, Garneyland, Paisley, filly, "Countess," 5 0 0
3. Duncan Davidson of Tulloch, Dingwall, gelding, ... 3 0 0
4. John S. Alston, Stockbriggs, Lesmahagow, filly, "Nora," Reserve Number,

SECTION 19. STALLIONS, MARES, or GELDINGS, for Leaping.

1. G. W. Richardson, Junior Club, Glasgow, mare, ... 10 0 0
2. James Fleming, Carmuirs, Falkirk, mare, "Maggie," 5 0 0
3. Durham Kippen of Busby, Glasgow, mare, "Lily of the Valley," . . 3 0 0

SECTION 20. MARES or GELDINGS, suitable for Carriage, foaled before 1st January 1872.

1. A. J. H. Somerville, Greenbank, Bothwell, gelding, "Prince," . . . 20 0 0
2. Thomas Jefferson Steel, Weary Hall, Southerfield, Abbey Town, gelding, "Storm," 10 0 0
3. Archd. Arrol, 18 Blythswood Sq., Glasgow, gelding, "Blarney," . . . 5 0 0
4. Alex. Duncan, Herbertshire Castle, Denny, gelding, "Monarque," Reserve Number,

SECTION 21. MARES or GELDINGS, suitable as Roadsters.

1. Lt.-Col. Carrick Buchanan of Drumpellier, Coatbridge, mare, . . . 10 0 0
2. Lawrence Drew, Merryton, Hamilton, gelding, ... 5 0 0
3. Durham Kippen of Busby, Glasgow, mare, "Lily of the Valley," . . 3 0 0
4. Jas. W. Morison, of Falfield, Cupar Fife, mare, "Jenny Wren," Reserve Number,

SECTION 22. MARES or GELDINGS, suitable as Hackneys or Roadsters, between 14 and 15 hands high.

1. Alexander Duncan, Herbertshire Castle, Denny, mare, "Zepha," . . 8 0 0
2. J. C. Wakefield, Eastwood Park, Thornliebank, mare, "Brunette," . . 4 0 0
3. H. N. Fraser, Hay Close, Penrith, mare, "Rosey," 2 0 0
4. R. M'Indoe, Merkins, Alexandria, mare, "Crusoe," . Reserve Number,

Carry forward, L.617 0 0

Brought forward, L.617 0 0

THOROUGHBRED STALLIONS.

William Charles Graham, Broom, Mearns, "Make Haste," . . . 50 0 0

EXTRA HORSES.

Commended.

American Trotting Stallion, belonging to James Bunten, Glasgow, "Prince von Bismarck," . . . . . Medium Silver Medal, 0 10 6

Roadster Stallion, belonging to John M. Martin, Auchendennan Farm, Balloch, "Derby," . . . . . Medium Silver Medal, 0 10 6

Half-bred Colt, belonging to Alex. B. Sandeman, Huntingtowerfield, Perth, Medium Silver Medal, 0 10 6

PONIES.

First Prize Stallions at former Shows—Exhibited for Medium Gold Medal.

Inverness, 1874, when the property of the presont Exhibitor—Miss Augusta Norton, Rannoch Lodge, Pitlochry, "Little Benjamin," . . . 6 2 0

SECTION 23. HIGHLAND STALLIONS, 14½ hands high and under.

1. John M. Martin, Auchendennan Farm, Balloch, "Joe," . . 6 0 0
2. The Hon. Lady Menzies, Rannoch Lodge, Pitlochrie, "Jerry," . . . 3 0 0
3. Do. do. do. do. "Tom," . . . 1 0 0

SECTION 24. HIGHLAND MARES or GELDINGS between 12 and 14½ hands high.

1. Duncan A. Macrae, Fernaig, Strome Ferry, mare, "Mhari Og," . . . 6 0 0
2. Duncan Davidson of Tulloch, Dingwall, gelding, ... 3 0 0

SECTION 25. MARES or GELDINGS between 13 and 14 hands high.

1. John Bell, Cleddens House, Bishopbriggs, mare, "Daisy," . . . 6 0 0
2. James Meikle, Nether Mains, Kilwinning, mare, "Miss Lucy," . . . 3 0 0
3. Thomas Wyse, Royal Hotel, Falkirk, mare, "Duchess Marie," . . . 1 0 0
4. Joseph Relph, Southernby, Hesket, Newmarket, mare, "Little Fan," Reserve Number,

SECTION 26. MARES or GELDINGS, between 12 and 13 hands high.

1. John M. Martin, Auchendennan Farm, Balloch, mare, "Caledonia," . . 6 0 0
2. James Syme, Millbank, Edinburgh, gelding, "Jumps," 3 0 0
3. John M. Martin, Auchendennan Farm, Balloch, mare, "Trottums," . . 1 0 0
4. Sir Michael R. Shaw Stewart, Bart., Ardgowan, Greenock, mare, Reserve Number,

SECTION 27. MARES or GELDINGS, 12 hands and under.

1. John M'Knight, Plann, Kilmarnock, gelding, "Billy," 6 0 0
2. George Ure, Wheatlands, Denny, mare, "Daisy," 3 0 0
3. John M. Martin, Auchendennan Farm, Balloch, mare, "Midge," . . 1 0 0
4. Duncan M'Farlane, Langloan, Coatbridge, mare, "Mary," Reserve Number,

L.723 13 6

CLASS III.—SHEEP.

CHEVIOT.

SECTION 1. TUPS above 1 Shear.

1. James Brydon, Kinnelhead, Moffat, ... L.12 0 0
2. John A. Johnstone, Archbank, Moffat, ... 6 0 0
3. Thomas Welsh, Ericstane, Moffat, ... 3 0 0
4. James Archibald, Glengelt, Lauder, . . . Reserve Number,

SECTION 2. DINMONT or SHEARLING TUPS.

1. John A. Johnstone, Archbank, Moffat, ... 12 0 0
2. Thomas Welsh, Ericstane, Moffat, ... 6 0 0
3. James Archibald, Glengelt, Lauder, ... 3 0 0
4. James Johnstone, Capplegill, Moffat, . . . Reserve Number,

Carry forward, L. 42 0 0

	Brought forward,	L.42	0 0

SECTION 3. Pens of 5 EWES above 1 Shear, with Lambs.

1. James Brydon, Kinnelhead, Moffat,		10	0 0
2. James Archibald, Glengelt, Lauder,		5	0 0
3. Thomas Welsh, Ericstane, Moffat,		2	0 0
4. Thomas Elliot, Hindhope, Jedburgh,	Reserve Number,		
Lambs.—1. James Brydon, Kinnelhead, Moffat,		2	0 0
2. James Archibald, Glengilt, Lauder,		1	0 0

SECTION 4. Pens of 5 SHEARLING EWES or GIMMERS.

1. James Archibald, Glengelt, Lauder,		10	0 0
2. James Brydon, Kinnelhead, Moffat,		5	0 0
3. Thomas Welsh, Ericstane, Moffat,		2	0 0
4. The Representatives of the late William Moffat, Easter Kinleith, Currie,	Reserve Number,		

BLACKFACED.

SECTION 5. TUPS above 1 shear.

1. John Archibald, Overshiels, Stow,		12	0 0
2. Thomas Aitken, Listonshiels, Balerno,		6	0 0
3. John Craig, South Halls, Strathaven,		3	0 0
4. David Foyer, Knowehead, Campsie,	Reserve Numbe.		

SECTION 6. DINMONT or SHEARLING TUPS.

1. James Greenshields, West Town, Lesmahagow,		12	0 0
2. Do., do., do.,		6	0 0
3. Do., do., do.,		3	0 0
4. John Archibald, Overshiels, Stow,	Reserve Number,		

SECTION 7. Pens of 5 EWES above 1 Shear, with Lambs.

1. John Archibald, Overshiels, Stow,		10	0 0
2. J. & J. Moffat, Gateside, Sanquhar,		5	0 0
3. John Hamilton, Lesmahagow,		2	0 0
4. Arch. Coubrough, High Craigton, Milngavie,	Reserve Number,		
Lambs.—1. J. & J. Moffat, Gateside, Sanquhar,		2	0 0
2. John Archibald, Overshiels, Stow,		1	0 0

SECTION 8. Pens of 5 SHEARLING EWES or GIMMERS.

1. John Archibald, Overshiels, Stow,		10	0 0
2 David Foyer, Knowehead, Campsie,		5	0 0
3. John Hamilton, Lesmahagow,		2	0 0
4. J. & J. Moffat, Gateside, Sanquhar,	Reserve Number,		

BORDER LEICESTER.

SECTION 9. TUPS above 1 shear.

1. Thomas Forster, jun., Ellingham, Chathill,		12	0 0
2. Andrew Smith, Castlemains, Gifford,		6	0 0
3. Richard Tweedie, The Forest, Catterick,		3	0 0
4. Thomas Forster, jun., Ellingham, Chathall,	Reserve Number,		

SECTION 10. DINMONT or SHEARLING TUPS.

1. James Clark, Oldhamstocks Mains, Cockburnspath,		12	0 0
2. James Melvin, Bonnington, Ratho,		6	0 0
3. The Marquis of Tweeddale, K.T., Yester, Haddington,		3	0 0
4. Rev. R. W. Bosanquet, Rock, Alnwick,	Reserve Number,		

SECTION 11. Pens of 5 EWES above 1 shear.

1. Rev. R. W. Bosanquet, Rock, Alnwick,		10	0 0
2. Henry Newby Fraser, Hayclose, Penrith,		5	0 0
3. James Nisbet, Lambden, Greenlaw,		2	0 0
4. Henry Newby Fraser, Hayclose, Penrith,	Reserve Number,		

SECTION 12. Pens of 5 SHEARLING EWES or GIMMERS.

1. James Clark, Oldhamstocks, Cockburnspath,		10	0 0
2. Richard Tweedie, The Forest, Catterick,		5	0 0
3. John Hill, Carlowrie, Cramond Bridge,		2	0 0
4. William Purvis, Linton Burnfoot, Kelso,	Reserve Number,		
	Carry forward,	L.234	0 0

	Brought forward,	L 231	0	0

LEICESTER.

SECTION 13. TUPS of any age.

1. T. H. Hutchinson, Manor House, Catterick,		8	0	0
2. Erick Sutherland, Tannachie House, Fochabers,		4	0	0
3. Do., do.,		2	0	0
4. Do., do.,	Reserve Number,			

SECTION 14. Pens of 5 EWES of any age, or GIMMERS.

1. Eric Sutherland, Tannachie House, Fochabers,		6	0	0

COTSWOLD.

SECTION 15. TUPS of any age.

1. John Gibson, Woolmet, Dalkeith,		8	0	0
2. Do., do.,		4	0	0
3. Do., do.,		2	0	0

SECTION 16. Pens of 5 EWES of any age, or GIMMERS.

1. John Gibson, Woolmet, Dalkeith,		6	0	0
2. Do., do.,		3	0	0

LINCOLN.

SECTION 17. TUPS of any age.

1. John Bell Irving, of Whitehill, Lockerbie,		8	0	0
2. Do., do.,		4	0	0
3. Do., do.,		2	0	0
4. Thomas Wilkin, Tinwald Downs, Dumfries,	Reserve Number,			

SECTION 18. Pens of 5 EWES of any age, or GIMMERS.

1. John Bell Irving, of Whitehill, Lockerbie,		6	0	0
2. Thomas Wilkin, Tinwald Downs, Dumfries,		3	0	0
3. John Bell Irving, of Whitehill, Lockerbie,		1	0	0
4. Thomas Wilkin, Tinwald Downs, Dumfries,	Reserve Number,			

SOUTHDOWN.

SECTION 19. TUPS of any age.—No Entry.

SECTION 20. Pens of 5 EWES of any age, or GIMMERS.—No Entry.

SHROPSHIRE.

SECTION 21. TUPS of any age.

1. Lord Chesham, Latimer, Chesham, Bucks,		8	0	0
2. Do., do., do.,		4	0	0
3. John Gibson, Woolmet, Dalkeith,		2	0	0
4. Lord Chesham, Latimer, Chesham, Bucks,	Reserve Number,			

SECTION 22. Pens of 5 EWES of any age, or GIMMERS.

1. Lord Chesham, Latimer, Chesham, Bucks,		6	0	0
2. John Gibson, Woolmet, Dalkeith,		3	0	0
3. The Earl of Strathmore, Glamis Castle, Glamis,		1	0	0
4. Lord Polwarth, Humbie, Upper Keith,	Reserve Number,			

EXTRA SECTIONS.

SECTION. 23. Pens of 5 CHEVIOT WETHERS, not above 4 Shear.

1. Charles Alexander, Easter Knowe, Stobo,		4	0	0

SECTION 24. Pens of 5 BLACKFACED WETHERS, not above 4 Shear

1. C. Macpherson Campbell, of Ballimore, Tighnabruaich,		4	0	0
2. William Tod, Glenree, Lamlash,		2	0	0

SECTION 25. Pens of 5 HALF-BRED HOGGS, not above 1 Shear.

1. James Cunningham, Tarbreoch, Dalbeattie,		4	0	0
2. Joseph Kerr, Flatts of Cargen, Dumfries,		2	0	0
3. Do., do., do.,	Reserve Number,			

	Carry forward,	L341	0	0

	Brought forward,	L.341	0 0

SECTION 26. Pens of 5 GREYFACED HOGGS, not above 1 Shear.—No Entry.

SECTION 27. Pens of 5 WETHER HOGGS of any Cross, not above 1 Shear.

1. Eric Sutherland, Tannachie House, Fochabers,	4	0	0
2. Lord Polwarth, Humbie, Upper Keith,	2	0	0
	L.347	0	0

CLASS IV.—SWINE.

LARGE BREED.

SECTION 1. BOARS.

1. The Earl of Ellesmere, Worsley Hall, Manchester,	L.8	0	0
2. Jacob Dove, Hambrook House, Hambrook,	4	0	0
3. R. E. Duckering, Northorpe, Kirton Lindsey,	2	0	0
4. Thomas Armstrong, 175 Craighall Road, Glasgow,	Reserve Number,		

SECTION 2. SOWS.

1. The Earl of Ellesmere, Worsley Hall, Manchester,	6	0	0
2. Jacob Dove, Hambrook House, Hambrook,	3	0	0
3. R. E. Duckering, Northorpe, Kirton Lindsey,	1	0	0
4. John Moir & Son, Garthdee, Aberdeen,	Reserve Number,		

SECTION 3. Pens of 3 PIGS, not above 8 months old.

1. R. E. Duckering, Northorpe, Kirton Lindsey,	4	0	0

BERKSHIRE.

SECTION 4. BOARS.

1. Jacob Dove, Hambrook House, Hambrook,	8	0	0
2. W. Macdonald, Woodlands, Perth,	4	0	0
3. John Moir & Son, Garthdee, Aberdeen,	2	0	0

SECTION 5. SOWS.

1. R. E. Duckering, Northorpe, Kirkton Lindsey,	6	0	0
2. Jacob Dove, Hambrook House, Hambrook,	3	0	0
3. W. Macdonald, Woodlands, Perth,	1	0	0
4. A. C. Douglas, of Mains, Milngavie,	Reserve Number,		

SECTION 6. Pens of 3 PIGS not above 8 months old.

1. John Moir & Son, Garthdee, Aberdeen,	4	0	0

SMALL BREED.

SECTION 7. BOARS.

1. The Earl of Ellesmere, Worsley Hall, Manchester,	8	0	0
2. Jacob Dove, Hambrook House, Hambrook, Bristol,	4	0	0
3. John Moir & Son, Garthdee, Aberdeen,	2	0	0
4. R. E. Duckering, Northorpe, Kirton Lindsey,	Reserve Number,		

SECTION 8. SOWS.

1. The Earl of Ellesmere, Worsley Hall, Manchester,	6	0	0
2. John Moir & Son, Garthdee, Aberdeen,	3	0	0
3. The Earl of Ellesmere, Worsley Hall, Manchester,	1	0	0
4. John Moir & Son, Garthdee, Aberdeen,	Reserve Number,		

SECTION 9. Pens of 3 PIGS not above 8 months old.

1. The Earl of Ellesmere, Worsley Hall, Manchester,	4	0	0
2. John Moir & Son, Garthdee, Aberdeen,	2	0	0
	L.86	0	0

CLASS V.—POULTRY.

SECTION 1. DORKING, Silver Grey—Cock.

1. John Fotheringham, Guthrie, Airth, Larbert,	1	0	0
2. James Cunningham, Tarbreoch, Dalbeattie,	0	10	0
Carry forward,	L.1	10	0

Brought forward, L.1 10 0

SECTION 2. DORKING, Silver Grey—2 Hens.

1. James Cunningham, Tarbreoch, Dalbeattie, ... 1 0 0
2. Wm. Christie, Junr., Craigend Park, Liberton, Edinburgh, . . . 0 10 0

SECTION 3. DORKING, Silver Grey—Cockerel.

1. John Fotheringham, Guthrie, Airth, Larbert, ... 1 0 0
2. Alex. Taylor, Fichnie, Kinellar, Blackburn, ... 0 10 0

SECTION 4. DORKING, Silver Grey—2 Pullets.

1. Mrs Geo. Armitstead, Inchmartine, Inchture, ... 1 0 0
2. Wm. Good, Chapelhall, Airdrie, ... 0 10 0

SECTION 5. DORKING, Coloured—Cock.

1. James Turnbull, Carnock Smithy, Larbert, ... 1 0 0

SECTION 6. DORKING, Coloured—2 Hens.

1. William Weir, Inches, Larbert, ... 1 0 0

SECTION 7. DORKING, Coloured—Cockerel.

1. James M'Nab, Glenochil, Menstrie, ... 1 0 0
2. James Turnbull, Carnock Smithy, Larbert, ... 0 10 0

SECTION 8. DORKING, Coloured—2 Pullets.

1. James M'Nab, Glenochil, Menstrie, ... 1 0 0
2. James Turnbull, Carnock Smithy, Larbert, ... 0 10 0

SECTION 9. COCHIN-CHINA—Cock.

1. Thomas Bruce, Busby, ... 1 0 0
2. P. C. Bruce, Ederline, Ford, Lochgilphead, ... 0 10 0

SECTION 10. COCHIN-CHINA—2 Hens.

1. Mrs John Hendrie, Castle Heather, Inverness, ... 1 0 0
2. Thomas Bruce, Busby, ... 0 10 0

SECTION 11. COCHIN-CHINA—Cockerel.

1. James Crawford, West Cambus, Cambus, ... 1 0 0
2. P. C. Bruce, Ederline, Ford, Lochgilphead, ... 0 10 0

SECTION 12. COCHIN-CHINA—2 Pullets.

1. James Wyse, West End, Falkirk, ... 1 0 0
2. James Crawford, West Cambus, Cambus, ... 0 10 0

SECTION 13. BRAMAHPOOTRA—Cock.

1. Alex. Robertson, Pegu Cottage, Kilmarnock, ... 1 0 0
2. George Willison, Superintendent of Police, Kilmarnock, ... 0 10 0

SECTION 14. BRAMAHPOOTRA—2 Hens.

1. John Young, Hailes Cottage, Slateford, ... 1 0 0
2. Henry Wyse, Bellevue Cottage, Bishopbriggs, ... 0 10 0

SECTION 15. BRAMAHPOOTRA—Cockerel.

1. Thomas Fullarton, Loans, Troon, ... 1 0 0
2. J. A. Dempster, 6 Albert Place, Stirling, ... 0 10 0

SECTION 16. BRAMAHPOOTRA—2 Pullets.

1. Thomas Fullarton, Loans, Troon, ... 1 0 0
2. John Young, Hailes Cottage, Slateford, ... 0 10 0

SECTION 17. SPANISH—Cock.

1. Mrs Gracie, Colinton, ... 1 0 0
2. Robert Waugh, 7 Palmerston Place Lane, Edinburgh, ... 0 10 0

SECTION 18. SPANISH—2 Hens.

1. Mrs Gracie, Colinton, ... 1 0 0
2. Arch. Gray, Miller, Waterloo, Wishaw, ... 0 10 0

Carry forward, L.26 0 0

Brought forward, L.26 0 0

SECTION 19. SPANISH—Cockerel.

1. Mrs Gracie, Colinton, ... 1 0 0
2. James Norval, Hawkhill Lodge, Alloa, ... 0 10 0

SECTION 20. SPANISH—2 Pullets.

1. James Norval, Hawkhill Lodge, Alloa, ... 1 0 0
2. Mrs Gracie, Colinton, ... 0 10 0

SECTION 21. SCOTCH GREY—Cock.

1. Wm. Girdwood, Brownlie, Carluke, ... 1 0 0
2. Alexander Hamilron, Braidwood Tile Works, Carluke, . . . 0 10 0

SECTION 22. SCOTCH GREY—2 Hens.

1. Alexander Hamilton, Braidwood Tile Works, Carluke, ... 1 0 0
2. Charles Gray, V.S., Kirk Road, Wishaw, ... 0 10 0

SECTION 23. SCOTCH GREY—Cockerel.

1. Thomas Lawrie, Linlithgow, ... 1 0 0
2. Wm. Girdwood, Brownlie, Carluke, ... 0 10 0

SECTION 24. SCOTCH GREY—2 Pullets.

1. Wm. Girdwood, Brownlie, Carluke, ... 1 0 0
2. Alex. Hamilton, Braidwood Tile Works, Carluke, ... 0 10 0

SECTION 25. HAMBURG, Pencilled—Cock.

1. C. R. B. Brown, Avon Grange, Hamilton, ... 1 0 0
2. H. Pickles, Earby, Leeds, ... 0 10 0

SECTION 26. HAMBURG, Pencilled—2 Hens.

1. John Fleming, Meadowbank Cottage, Strathaven, ... 1 0 0
2. John Conkey, Temple Street, Darvel, Kilmarnock, ... 0 10 0

SECTION 27. HAMBURG, Pencilled—Cockerel

1. H. Pickles, Earby, Leeds, ... 1 0 0
2. John Fleming, Meadowbank Cottage, Strathaven, ... 0 10 0

SECTION 28. HAMBURG, Pencilled—2 Pullets.

1. John Fleming, Meadowbank Cottage, Strathaven, ... 1 0 0
2. H. Pickles, Earby, Leeds, ... 0 10 0

SECTION 29. HAMBURG, Spangled—Cock.

1. David Galbraith, Merchant, Busby, ... 1 0 0
2. H. Pickles, Earby, Leeds, ... 0 10 0

SECTION 30. HAMBURG, Spangled—2 Hens.

1. G. Caithness, Dundee Street, Carnoustie, ... 1 0 0
2. Mrs Brown, Abercairny, Crieff, ... 0 10 0

SECTION 31. HAMBURG, Spangled—Cockerel.

1. Robert M'Nab, Cardonald, Govan, ... 1 0 0
2. Mrs Brown, Abercairny, Crieff, ... 0 10 0

SECTION 32. HAMBURG, Spangled—2 Pullets.

1. H. Pickles, Earby, ... 1 0 0
2. Donald M'Lachlan, Maryhill, Glasgow, ... 0 10 0

SECTION 33. POLISH—Cock.

1. H. Pickles, Earby, Leeds, ... 1 0 0
2. John Stevenson, Chapelhall, Airdrie, ... 0 10 0

SECTION 34. POLISH—2 Hens.

1. Walter Gibb, Wishaw, ... 1 0 0
2. H. Pickles, Earby, Leeds, ... 0 10 0

SECTION 35. POLISH—Cockerel.

1. John Stevenson, Chapelhall, Airdrie, ... 1 0 0
2. Walter Gibb, Wishaw, ... 0 10 0

Carry forward, L.51 10 0

Brought forward, L.51 10 0

SECTION 36. POLISH—2 Pullets.

1. Walter Gibb, Wishaw, ... 1 0 0
2. John Stevenson, Chapelhall, Airdrie, ... 0 10 0

SECTION 37. GAME, Black or Brown Reds—Cock.

1. D. Harley, Rosebank House, Edinburgh, ... 1 0 0
2. Do. do. do. 0 10 0

SECTION 38. GAME, Black or Brown Reds—1 Hen.

1. James F. Ferguson, Dalmuir, ... 1 0 0
2. Robert Stewart, Bridge House, Blair-Adam, ... 0 10 0

SECTION 39. GAME, Black or Brown Reds—Cockerel.

1. D. Harley, Rosebank House, Edinburgh, ... 1 0 0
2. C. Jamieson, 25 Castle Street, Forfar, ... 0 10 0

SECTION 40. GAME, Black or Brown Reds—1 Pullet.

1. William Chambers, Leslie, Fife, ... 1 0 0
2. Do., do., ... 0 10 0

SECTION 41. GAME, Duckwings, or any other Variety—Cock.

1. D. Harley, Rosebank House, Edinburgh, ... 1 0 0
2. Do., do., ... 0 10 0

SECTION 42. GAME, Duckwings, or any other Variety—1 Hen.

1. D. Harley, Rosebank House, Edinburgh, ... 1 0 0
2. Do., do., do., ... 0 10 0

SECTION 43. GAME, Duckwings, or any other Variety—Cockerel.

1. D. Harley, Rosebank House, Edinburgh, ... 1 0 0
2. A. & J. Mackay, Cross Arthurlie, Barrhead, ... 0 10 0

SECTION 44. GAME, Duckwings, or any other Variety—1 Pullet.

1. D. Harley, Rosebank House, Edinburgh, ... 1 0 0
2. C. Jamieson, 25 Castle Street, Forfar, ... 0 10 0

SECTION 45. BANTAMS, Game—Cock.

1. Robert Brownlie, Townsend, Kirkcaldy, ... 1 0 0
2. Sir Geo. Macpherson Grant of Ballindalloch, Bart. 0 10 0

SECTION 46. BANTAMS, Game—1 Hen.

1. J. D. Donald, 93 Bridge Street, Montrose, ... 1 0 0
2. Robert Brownlie, Townsend, Kirkcaldy, ... 0 10 0

SECTION 47. BANTAMS, Game—Cockerel.

1. Robert Brownlie, Townsend, Kirkcaldy, ... 1 0 0
2. Do., do., do. 0 10 0

SECTION 48. BANTAMS, Game—1 Pullet.

1. Robert Brownlie, Townsend, Kirkcaldy, ... 1 0 0
2. Do., do., do.. . . . . 0 10 0

SECTION 49. BANTAMS, Sebright—Cock.

1. Alexander Robertson, Pegu Cottage, Kilmarnock, ... 1 0 0
2. Miss Robina Frew, Sinclairtown, Kirkcaldy, ... 0 10 0

SECTION 50. BANTAMS, Sebright—2 Hens.

1. Miss Bessie P. Frew, Sinclairtown, Kirkcaldy, ... 1 0 0
2. Alex. Robertson, Pegu Cottage, Kilmarnock, ... 0 10 0

SECTION 51. BANTAMS, Sebright—Cockerel.

1. Alex. Robertson, Pegu Cottage, Kilmarnock, ... 1 0 0
2. Miss Robina Frew, Sinclairton, Kirkcaldy, ... 0 10 0

SECTION 52. BANTAMS, Sebright—2 Pullets.

1. Alex. Robertson, Pegu Cottage, Kilmarnock, ... 1 0 0
2. Miss Bessie P. Frew, Sinclairton, Kirkcaldy, ... 0 10 0

L.77 0

Brought forward, L.77 0 0

SECTION 53. BANTAMS—Any other variety—Cock.

1. Wm. Shaw, Margaret's Cottage, Dean Street, Kilmarnock (Black), . . 1 0 0
2. J. D. Donald, 93 Bridge Street, Montrose (Black, rose-combed), . . 0 10 0

SECTION 54. BANTAMS—Any other variety—2 Hens.

1. D. M'Laren, 4 Douglas Street, Kilmarnock (Black), ... 1 0 0
2. Miss Robina Frew, Sinclairton, Kirkcaldy (Black) 0 10 0

SECTION 55. BANTAMS—Any other variety—Cockerel.

1. Mrs Robert Frew, Sinclairton, Kirkcaldy (Black) 1 0 0
2. D. M'Laren, 2 Douglas Street, Kilmarnock (Black), ... 0 10 0

SECTION 56. BANTAMS—Any other variety—2 Pullets.

1. Robert Frew, Sinclairton, Kirkcaldy (Black) 1 0 0
2. William Shaw, Margaret's Cottage, Dean Street, Kilmarnock (Black), . . 0 10 0

SECTION 57. POULTRY—Any other Pure Breed—Cock.

1. John C. Shaw, Craighead, Barrhead (Creve Cœur), ... 1 0 0
2. H. Pickles, Earby, Leeds (Black Hamburg), ... 0 10 0

SECTION 58. POULTRY—Any other Pure Breed—2 Hens.

1. H. Pickles, Earby, Leeds (Black Hamburg), ... 1 0 0
2. John B. Brown, The Cottage, Gilmerton, Liberton (Houdan), . . . 0 10 0

SECTION 59. POULTRY—Any other Pure Breed—Cockerel.

1. Thomas Fullarton, Loans, Troon (Houdan), ... 1 0 0
2. Allan Carswell, Main Street, Barrhead (Creve Cœur), ... 0 10 0

SECTION 60. POULTRY—Any other Pure Breed—2 Pullets—No Entry.

SECTION 61. DUCKS—White Aylesbury—Drake.

1. Robert Wallace, Auchenbrain, Mauchline, ... 1 0 0
2. Thomas Adam, Millburn, Renfrew. 0 10 0

SECTION 62. DUCKS—White Aylesbury—2 Ducks.

1. Robert Wallace, Auchenbrain, Mauchline, ... 1 0 0
2. John M. Martin, yr. of Auchendennan, Bloomhill, Cardross, . . . 0 10 0

SECTION 63. DUCKS—White Aylesbury—Drake (Young).

1. Robert Wallace, Auchenbrain, Mauchline, ... 1 0 0
2. Thomas Adam, Millburn, Renfrew, ... 0 10 0

SECTION 64. DUCKS—White Aylesbury—2 Ducklings.

1. Mrs Weir, Rosehill, Falkirk, ... 1 0 0
2. Thomas Adam, Millburn, Renfrew, ... 0 10 0

SECTION 65. DUCKS—Rouen—Drake.

1. Robert Wallace, Auchenbrain, Mauchline, ... 1 0 0
2. Captain Lyon, R.N., Kirkmichael, Dumfries, ... 0 10 0

SECTION 66. DUCKS, Rouen—2 Ducks.

1. Robert Wallace, Auchenbrain, Mauchline, ... 1 0 0
2. John Pollock, Walton, Neilston, ... 0 10 0

SECTION 67. DUCKS, Rouen, Drake (Young).

1. John Pollock, Walton, Neilston, ... 1 0 0
2. John Thomson, Blaiket, Crocketford, Dumfries, ... 0 10 0

SECTION 68. DUCKS, Rouen—2 Ducklings.

1. Captain Lyon, R.N., Kirkmichael, Dumfries, ... 1 0 0
2. John Thomson, Blaiket, Crocketford, Dumfries, ... 0 10 0

SECTION 69. DUCKS, any other Pure Breed—Drake.

1. Miss Augusta Norton, Rannoch Lodge, Pitlochry, ... 1 0 0

SECTION 70. DUCKS, any other Pure Breed—2 Ducks.

1. Miss Augusta Norton, Rannoch Lodge, Pitlochry, ... 1 0 0

Carry forward, L.101 10 0

Brought forward, . L.101 10 0

SECTION 71. DUCKS, any other Pure Breed—Drake (Young).—No Entry.

SECTION 72. DUCKS, any other Pure Breed—2 Ducklings.—No Entry.

SECTION 73. TURKEYS, Black Norfolk—Cock.

1. Mrs Weir, Rosehill, Falkirk, ... 1 0 0
2. Lord Kinnaird, K.T., Rossie Priory, Inchture, ... 0 10 0

SECTION 74. TURKEYS, Black Norfolk—2 Hens.

1. Andrew Mitchell, East Kerse, Mains, Bo'ness, ... 1 0 0
2. Lord Kinnaird, K.T., Rossie Priory, Inchture, ... 0 10 0

SECTION 75. TURKEYS, Black Norfolk—Cock (Poult).—No Entry.

SECTION 76. TURKEYS, Black Norfolk—2 Hens (Poults).—No Entry.

SECTION 77. TURKEYS, any other Breed—Cock.

1. James Allan, Hillhead Cottage, Carluke (Cambridge), ... 1 0 0
2. Miss Augusta Norton, Rannoch Lodge, Pitlochry (American Bronze), . . 0 10 0

SECTION 78. TURKEYS, any other Breed—2 Hens.

1. Miss Augusta Norton, Rannoch Lodge, Pitlochry (American Bronze), . . 1 0 0
2. James Allan, Hillhead Cottage, Carluke (Cambridge), ... 0 10 0

SECTION 79. TURKEYS, any other Breed—Cock (Poult).

1. Wm. Hart, Kirkland, Auchterarder (Cross), ... 1 0 0

SECTION 80. TURKEYS, any other Breed—2 Hens (Poults).

2. Wm. Hart, Kirkland, Auchterarder (Cross), ... 0 10 0

SECTION 81. GEESE, Grey Toulouse—Gander.

1. William Carmichael, Pool, Auchingray, Carnwath. 1 0 0
2. Do., do., do., ... 0 10 0

SECTION 82. GEESE, Grey Toulouse—2 Geese.

1. William Carmichael, Pool, Auchingray, Carnwath, . . . 1 0 0
2. Do., do., do., . . . 0 10 0

SECTION 83. GEESE, Grey Toulouse—Gander (Young).

1. John M. Martin, yr. of Auchendennan, Bloomhill, Cardross, . . . 1 0 0

SECTION 84. GEESE, Grey Toulouse—2 Goslings.

1. John M. Martin, yr. of Auchendennan, Bloomhill, Cardross, . . . 1 0 0
2. William Carmichael, Pool, Auchingray, Carnwath, ... 0 10 0

SECTION 85. GEESE, Embden—Gander.

1. Lord Kinnaird, K.T., Rossie Priory, Inchture, ... 1 0 0

SECTION 86. GEESE, Embden—2 Geese.

1. John M. Martin, yr. of Auchendennan, Bloomhill, Cardross, . . . 1 0 0
2. Lord Kinnaird, K.T., Rossie Priory, Inchture, ... 0 10 0

SECTION 87. GEESE, Embden, Gander (Young).—No Entry.

SECTION 88. GEESE, Embden, 2 Goslings.—No Entry.

SECTION 89. GEESE, any other Pure Breed—Gander.

1. Captain Lyon, R.N., Kirkmichael, Dumfries (Chinese), ... 1 0 0

SECTION 90. GEESE, any other Pure Breed, 2 Geese.—No Entry.

SECTION 91. GEESE, any other Pure Breed Gander. (Young).—No Entry.

SECTION 92. GEESE, any other Pure Breed, 2 Goslings.—No Entry.

L.118 0 0

d

Class VI.—DAIRY PRODUCE.

BUTTER.

Section 1. CURED.

1.	Arthur Gilmour, Crosshill, East Kilbride,	L.6	0	0
2.	Andrew Lithgow, Drumtall, East Kilbride,	4	0	0
3.	William Reid, Calderside, Blantyre,	2	0	0
4.	Samuel Wallace, Chapelton, Maryhill, Reserve Number,			

Section 2. POWDERED.

1.	John Hutcheson, Netherhouse, Old Monkland,	6	0	0
2.	Donald M'Farlane, Balmuldy House, Bishopbriggs,	4	0	0
3.	Donald M'Laren, Middleton, Milngavie,	2	0	0
4.	Archibald Bulloch, Milliken, East Kilpatrick, Reserve Number,			

Section 3. FRESH.

1.	Henry Orr, Torrance, Bathgate,	6	0	0
2.	Arthur Gilmour, Crosshill, East Kilbride,	4	0	0
3.	Donald M'Laren, Middleton, Milngavie,	2	0	0
4.	Thomas Clark, Drumby, Busby, Reserve Number,			

CHEESE.

Section 4. CHEDDAR—Variety.

1.	Allan M'Master, Glenhead House, Stranraer,	6	0	0
2.	James M'Master, Currochturie, Kirkmaiden,	4	0	0
3.	William M'Master, Challoch, Glenluce,	2	0	0

Section 5. DUNLOP—Variety.

1.	James Shearer, Holm Farm, Stonehouse, N.B.,	6	0	0
2.	Andrew Gemmel, Caplaw, Neilston,	4	0	0
3.	John White, Nether Craigends, Linwood, Paisley,	2	0	0

Section 6. SWEET MILK CHEESE—Any other Variety.

1.	Andrew Picken, Glassoch, Fenwick,	6	0	
2.	Mrs William Dickie, Girthill, Dalry, Ayrshire,	4	0	0
3.	James Spens, Low Ardwell, Stranraer,	2	0	0
		L.72	0	0

Class VII.—IMPLEMENTS.

Silver Medals were awarded to the following:—

1. Aveling & Porter, Rochester, Kent, for Agricultural Locomotive.
2. John G. Rollins & Co., Old Swan Wharf, London Bridge, London, for American Horse Hay Rake.
3. Richmond & Chandler, Salford, Manchester, for Chaff-cutter, new gearing.
4. James Angus, Parkhead, Glasgow, for Improved Farm Carts.
5. Henry Bennet & Co., 123 Hope Street, Glasgow, for Brotherhood's Three Cylinder Engine.
6. P. & W. MacLellan, 129 Trongate, Glasgow, for M'Kean's Patent Rock Drilling Machine, No. 1.
7. Marshall, Sons, & Co. (Limited), Britannia Iron Works, Gainsborough, for Thrashing and Finishing Dressing Machine (A. 3).
8. Robey & Co., Lincoln, for Twelve Horse Power Double Cylinder New Patent Horizontal Engine and Locomotive Boiler Combined.
9. Richard Scholefield, Kirkstall Road, Leeds, for Patent Semi-Dry Brick Machine, with press on top.
10. Walter A. Wood, 36 Worship Street, London, for Self-delivering Reaper (at trial at Woolmet, on 31st August).
11. Robert Parker, Culhorn Parks, Stranraer, for Manure Distributor (at trial at Liberton Tower Mains, on 12th October).

Medium Silver Medals to:—

1. Harrison, M'Gregor, & Co., Albion Foundry, Leigh, Manchester, for One-horse "Albion" Combined Mower and Reaper.
2. Head, Wrightson, & Co., Teesdale Iron Works, Stockton-on-Tees, for Hand Hoists, invented by Thos. Moore and C. A. Head.
3. William Lincolne & Co., 77 John Street, Glasgow, and 32 Ludgate Hill, London, for Steam Trap, invented by Robinson.
4. John Richardson, London Road, Carlisle, for Combined Corn and Grass Seed Dressing Machine.

5. G. W. Murray and Co., Banff Foundry, Banff, for Turnip Sower.
6. J. & A. Barr, 21 Bishop Street, Anderston, Glasgow, for Water-Pressure Engines of Small Power.
7. The Northern Agricultural Implement and Foundry Company (Limited), Inverness for Zig-Zag Harrows.
8. Jonathan Pickering, Globe Works, Stockton-on-Tees, for Patent Steam Pump.

Minor Silver Medals to—

1. Thomas Leslie, 7, 9, and 11 Robertson Street, Glasgow, for General Collection.
2. Francis Morton & Co. (Limited), Naylor Street, Liverpool, for General Collection.
3. Douglas, Cowan, & Co., 228 Dobbie's Loan, Glasgow, for General Collection of Agricultura Implements.
4. Thomas Gibson & Son, Bainfield Iron and Wire Works, West Fountainbridge, Edinburgh, for General Collection of Agricultural Implements.
5. Picksley, Sims, & Co. (Limited), Bedford Foundry, Leigh, Lancashire, for General Collection of Agricultural Implements.
6. Adam T. Pringle, 6 India Buildings, Edinburgh, and Kelso, for General Collection of Agricultural Implements.
7. Smith & Simons, 36 and 38 Howard Street, Glasgow, for General Collection of Agricultural Implements.
8. Richard Bickerton & Sons, Old Tweed Implement Works, Berwick-on-Tweed, for Collection.
9. Robert Brown & Son, Ferguslie Fire Clay Works, Paisley, for Collection.
10. Thomas Brown & Sons, Clockmill, Dunse, for Collection.
11. David Cassells & Son, Newton Mearns, for Thrashing Machine with Fanners, Range, and Riddles.
12. James P. Cathcart, 2 Stanley Place, Ayr, and Glasgow, for Collection
13. John Doe, Errol, for Collection.
14. John Drummond, Cumnock, for Two Horse-Power Thrashing Machine with Horse Works complete.
15. P. & R. Fleming & Co., 29 Argyle Street, Glasgow, for Collection.
16. George Gray & Co., Uddingston, Glasgow, for Collection.
17. John Gray & Co., Uddingston Ironworks, Uddingston, Glasgow, for Collection.
18. Haughton & Thompson, Carlisle, for Collection.
19. James Howorth, Victoria Works, Farnworth, Bolton, for Collection.
20. William Hume, 195 Buchanan Street, Glasgow, for Collection.
21. Thomas Hunter, Maybole, for Collection.
22. Alexander Jack & Sons, Maybole, for Collection.
23. Kemp, Murray, & Nicholson, Stirling, for Collection.
24. George M'Cartney & Co., Cumnock, for Thrashing Machine.
25. A. & J. Main & Co., Scott Street, Port-Dundas, Glasgow, for Collection.
26. T. Pirie & Co., Kinmundy, Longside, Aberdeenshire, for Collection.
27. Andrew Pollock, Mauchline, for Barrow Wheel of Iron.
28. Ben. Reid & Co., Agricultural Implement Makers, Seedsmen and Nurserymen, Bon-Accord Works, Aberdeen, for Collection.
29. George Sellar & Son, Huntly, for Collection.
30. Thomas Sherriff & Co., West Barns, Dunbar, for Collection.
31. John Wallace & Sons, Graham Square, Glasgow, for Collection.
32. Thomas Leadbetter & Co., 13 Gordon Street, Glasgow, for Portable Fire Engines and Liquid Manure Pumps.

ABSTRACT OF PREMIUMS.

Cattle,			L.1044 14 0
Horses,			723 13 6
Sheep,			347 0 0
Swine,			86 0 0
Poultry,			118 0 0
Dairy Produce,			72 0 0
Implements—			
11 Silver Medals,	L.8 16 0		
8 Medium Silver Medals,	4 4 0		
32 Minor Silver Medals,	9 12 0		
			22 12 0
			L.2413 19 6

LIST OF JUDGES.

SHORTHORN.—George Drewry, Holker House, Cark-in-Cartnel, Lancashire; Robert Jefferson, Preston Hows, Whitehaven; James Cochrane, Little Haddo, Newburgh, Aberdeen.

POLLED ANGUS OR ABERDEEN.—Alex. Bowie, Mains of Kelly, Arbroath; Thomas Ferguson, Kinnochtry, Coupar-Angus; James Mackessack, Earnside, Forres.

GALLOWAY.—David Hardie, Priesthaugh, Hawick; John Thomson, Blaiket, Crocketford, Dumfries.

AYRSHIRE.—Alex. Allan, Carbarns, Wishaw; James Howie, Burnhouses, Galston, Kilmarnock: Alex. Murdoch, Gartcraig, Shettleston, Glasgow.

HIGHLAND—John Macfarlan, Faslane, Garelochhead; Donald M'Intyre, Tighnablair, Comrie.

FAT STOCK (CATTLE AND SHEEP).—Alexander Young, Keir Mains, Dunblane; John Bell, 172 Argyle Street, Glasgow.

CLYDESDALE STALLIONS AND COLTS.—Oliphant Brown, Shiel, New Galloway; William Findlay, Brackenbrae, Bishopbriggs; John Park, Glenshinnoch, Erskine, Glasgow.

CLYDESDALE MARES AND FILLIES, MILK-CART HORSES AND GELDINGS.—Robert Finlay of Springhill, Bailieston, Glasgow; William Lang, Lochmill, Milton of Campsie; John Macadam, Blairoer, Drymen.

HUNTERS, ROADSTERS, PONIES, AND EXTRA HORSES.—John Anstruther Thomson of Charlton, Colinsburgh; Colonel J. G. Hay Boyd of Townend, Symington, Kilmarnock; John W. Paterson, Terrona, Langholm.

CHEVIOT.—William Grieve, Skelfhill, Hawick; William Mitchell, Pulrossie, Dornoch; Henry Scott, Gilmanscleuch, Selkirk.

BLACKFACED.—John Johnstone, Kingledores, Biggar; James Craig, Polquheys, New Cumnock; James Blake, Wester Moy, Beauly.

BORDER LEICESTER.—John Usher, Stodrig, Kelso; Jacob Wilson, Woodhorn Manor, Morpeth; John Dickenson, Bemersyde Cottage, St Boswells.

LEICESTER, COTSWOLD, LINCOLN, SOUTHDOWN, AND SHROPSHIRE.—Charles Randell, Chadbury, Evesham; Thomas Horley, jun., The Fosse, Leamington; William Ford, Hardengreen, Dalkeith.

SWINE.—Thomas D. Findlay of Easterhill, Tollcross, Glasgow; John Fisher, Carhead, Cross Hills, Yorkshire.

POULTRY.—Richard Teebay, Fulwood, Preston; John Jardine, Mill Lane Forge, Kilmarnock.

DAIRY PRODUCE.—Thomas Baillie, 15 Victoria Street, Edinburgh; Bailie Osborne, Glasgow: George T. Samson, Old Cumnock.

IMPLEMENTS.—*Society's Inspecting Committee*—J. W. Hunter of Thurston, Dunbar, Chairman of the Society's Machinery Committee; David Stevenson, C.E., Edinburgh, Consulting Engineer to the Society; Professor Wilson, Edinburgh; John Munro, Fairnington, Kelso; P. B. Swinton, Holyn Bank, Gifford; James D. Park, Edinburgh, Practical Engineer to the Society. *Local Committee*—John Young, Fulwood, Paisley; J. Colquhoun, Corkerhill, Pollockshaws; Alex. Allan, Carbarns, Wishaw; John Waugh, St John's Kirk, Biggar; John Murray, Grougar, Kilmarnock; James Drennan, Auchinlee, Ayr.

LIST OF ATTENDING MEMBERS.

SHORTHORN.—Graham Somervell of Sorn, Mauchline; Allan Steven, Clincart, Cathcart, Glasgow.

POLLED ANGUS OR ABERDEEN.—John Gordon of Aikenhead, Cathcart, Glasgow; John Pollock of Blackhouse, Mearns.

GALLOWAY.—Lieut.-Colonel Carrick Buchanan of Drumpellier, Coatbridge; James Fleming, Castleton, Carmunnock.

AYRSHIRE.—Charles Howatson of Dornel, Manchline; Colin M'Lachlan, Drums, Greenock.

HIGHLAND,—Sir Henry Seton Steuart, Bart.; James Clelland, Knockenlaw, Kilmarnock.

FAT STOCK (CATTLE AND SHEEP).—C. G. Shaw, Ayr; Quintin Bone, Greenan, Ayr.

CLYDESDALE STALLIONS AND COLTS.—Commander Hamilton of Rozelle, R.N., Ayr; Robert Murdoch, Hallside, Cambuslang.

CLYDESDALE MARES AND FILLIES, MILK CART-HORSES AND GELDINGS.—J. Pettigrew Wilson of Polquhairn; Robert Guthrie, Crossburn, Troon.

HUNTERS, ROADSTERS, PONIES, AND EXTRA HORSES.—Archd. C. Douglas of Mains, Milngavie: James Holmes of Kirkstyle, Cornsilloch, Carluke.

CHEVIOT.—Captain Orde, yr. of Kilmory, Auchnaba, Lochgilphead; Andrew Smith, Castlemains, Douglas.

BLACKFACED.—C. Macpherson Campbell of Ballimore, Tighnabruaich; Duncan Buchanan of Achdachyearnbeg, Colintraive, Greenock.

BORDER LEICESTER.—Gavin Hamilton of Auldtown, Lesmahagow; James Allan, jun., Balnacoole, Brodick.

LEICESTER, COTSWOLD, LINCOLN, SOUTHDOWN, AND SHROPSHIRE.—Robert Hutchison of Carlowrie, Kirkliston; Robert M'Kean, Lumloch, Bishopbriggs.

SWINE.—Hon. G. R. Vernon, Auchans House, Kilmarnock; J. M. Martin, yr. of Auchendennan, Bloomhill, Cardross.

POULTRY.—Allan Kirkwood, Killermont, Maryhill; Charles Duncan, Woodend, Rothesay.

DAIRY PRODUCE.—Robert M'Alister, Mid Ascog, Rothesay; Thomas Tennant of Priestgill.

IV.—DISTRICT COMPETITIONS.

CATTLE.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.
Vale of Alford	William M'Combie, of Tillyfour, M.P.	Polled Bull,	Silver Medal	L.0 16 0
	James Reid, Greystone	do.	Class I.† L.4 & Med. Sil. Med.	4 10 6
	William Anderson, Wellhouse	do.	do.	3 0 0
	John Hunter, Confunderland	do.	Class II‡ L.3 & Med. Sil. Med.	3 10 6
	George Wilken, Waterside of Forbes	do.	do.	2 0 0
	John Hunter, Confunderland	do.	do.	1 0 0
	John Anderson, Kinstair	Shorthorn Heifer	L.3 & Med. Sil. Med.	3 10 6
	Wm. Mitchell, Auchnagathle	do,	do.	2 0 0
	A. Bruce, Wealthiton	do.	do.	1 0 0
Spey, Avon, and Fiddochside	Sir G. Macpherson Grant, Bart.	Polled Bull	Silver Medal	0 16 0
	Thomas F. Inkson, Kinermony	do.	Class I. L.4 & Med. Sil. Med.	4 10 6
	Robert Turner, Achnarrow	do,	do.	3 0 0
	James Innes, Achmore	do.	do.	1 0 0
	William Robertson, Burnside.	do.	Class II. L.3 & Med. Sil. Med.	3 10 6
	John Macpherson, Achlochrach	do.	do.	2 0 0
	James Petrie, Glencorrie	do.	do.	1 0 0
	James M'William, Stoneytown	Shorthorn Heifer	L.3 & Med. Sil. Med.	3 10 6
	John G. Smith, Minmore	do.		2 0 0
	John G. Smith, Minmore	do.		1 0 0
Island of Skye	Robert A. Macdonald, Lyndale	Highland Bull	Class I. L.4 & Med. Sil. Med.	4 10 6
	D. MacRae, Oze	do.	do.	3 0 0
	John Robertson, Greshornish	do.	do.	1 0 0
	R. A. Macdonald, Lyndale	Highland Heifer	L.3 and Med. Sil. Med.	3 10 6
	D. MacRae, Oze	do.		2 0 0
	John Robertson, Greshornish	do.		1 0 0
County of Elgin	R. Bruce, Newton of Struthers	Shorthorn Bull	Silver Medal	0 16 0
	Simon Keir, Burnside	do.	Class I. L.2 & Med. Sil. Med.	2 10 0*
	A. B. Law, Hole Boharm	do.	do.	1 10 0*
	Richard J. Mackay, Burgie	do,	do.	0 10 0
	Robert Scott, Manbeen	do.	Class II. L.3 & Med. Sil. Med.	3 10 6
	James Ruxton, Inchbroom	do.	do.	2 0 0
	Alex. Gilbert, Knockhourn	do.	do.	1 0 0
	R. Bruce, Newton of Struthers	Shorthorn Heifer	L.3 & Med. Sil. Med.	3 10 6
	Duke of Richmond, Gordon Castle	do.		2 0 0
	Duke of Richmond, Gordon Castle	do.		1 0 0
Strathbogie	Walter Scott, Glendronach	Shorthorn Bull	Class I. L.4 & Med. Sil. Med.	4 10 6
	Walter Scott, Glendronach	do.	do.	3 0 0
	John Wilson, Piriesmill	do.	do.	1 0 0
	James Bruce, Burnside	do	Class II. L.3 & Med. Sil. Med.	3 10 6
	James Merson, Craigwillie	do.	do.	2 0 0
	Charles Bruce, Broadlands	do.	do.	1 0 0
	Charles Bruce, Broadlands	Shorthorn Heifer	L3. & Med. Sil. Med.	3 10 6
	Walter Scott, Glendronach	do.		2 0 0
	Walter Scott, Glendronach	do.		1 0 0
United Banffshire	Andrew Longmore, Rettie	Shorthorn Bull	Silver Medal	0 16 0
	A. Scott, Towie Barclay	do.	Class I. L.4 & Med. Sil. Med.	4 10 6
	S. Smith, Thriepland	do.	do.	3 0 0
	Walter Scott, Glendronach	do.	do.	1 0 0
	Andrew Longmore, Rettie	do.	Class II. L.3 & Med. Sil. Med.	3 10 6
	James Merson, Craigwillie	do.	do.	2 0 0
			Carry forward,	L.113 12 0

* Half Premiums awarded, the number of Lots being under four.

† Aged Bulls. ‡ Two-year-old Bulls.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.
		Brought forward,		L.113 12 0
	Messrs Duncan & Rust, Puddocklaw	Shorthorn Bull	Class II.	1 0 0
	Robert Walker. Montbletton	Polled Heifer	L3 and Med. Sil. Med.	3 10 6
	Robert Walker, Montbletton	do.		2 0 0
County of Stirling	Alex, Buchanan, Whitehouse	Shorthorn Bull	Class I. Med. Sil. Med.	0 10 6
	J. T. S. Paterson, Plean	do.	Class II. Med. Sil. Med.	0 10 6
	James Burrell, Denovan Mains	Ayrshire Heifer	Med. Sil. Med.	0 10 6
Kincardine	Robert B. Walker, Portlethen	Polled Bull,	Class I. Med. Sil. Med.	0 10 6
	John Stott, Greenheads	Shorthorn Heifer	Med. Sil. Med.	0 10 6
Garioch	Colonel Leith Hay of Rannes, C.B.	Shorthorn Bull,	Silver Medal	0 16 0
	William M'Knight, Boghead	Polled Bull	Class I. Med. Sil. Med.	0 10 6
	C. P. Gordon of Wardhouse	do.	Class II. Med. Sil Med.	0 10 6
	William Mackie, Petty	Shorthorn Heifer	Med. Sil. Med.	0 10 6

HORSES FOR AGRICULTURAL PURPOSES.

West. Dist. of Fife	John Galloway, Lochton .	Stallion		25 0 0
Strathendrick	John Macdonald, Porterfield	Stallion		25 0 0
Dist. of R. Northern Society	George Duncan, Port Elphinstone	Stallion		25 0 0
Black Isle	Jonathan Middleton, Davidston	Brood Mare	L.4 and Med. Sil. Med.	4 10 6
	Robert Trotter, Garguston	do.		3 0 0
	James Cameron, Balnakyle	do.		1 0 0
Buchan	Alexander Bruce, Millhill	Brood Mare	L.4 and Med. Sil. Med.	4 10 6
	Alex. Park, Mains of Kindrought	do.		3 0 0
	William Hutchison of Cairngall	do.		1 0 0
Kinross	James Walls, Loehran	Brood Mare	L.4 and Med. Sil. Med.	4 10 6
	John Robertson, Blairhead	do.		3 0 0
	James Reid, Kirkness	do.		1 0 0
Selkirk & Galashiels	Walter Elliot, Holybush	Brood Mare	L.4 & Med. Sil. Medal	4 10 6
	James Lawrie, Mitchelston	do.		3 0 0
	James Lawrie, Mitchelston	do.		1 0 0
Caithness	James M'Kidd, Thurso East	Brood Mare	L.4 & Med. Sil. Medal	4 10 6
	William Purves, Barock Mains	do.		3 0 0
	James Purves, Lochend	do.		1 0 0
Haddington	Adam Smith, Stevenson Mains	Two-year-old Colt	L.3 & Med. Sil. Med.	3 10 6
	James Darling, Priestlaw	do.		2 0 0
	William M'Gowan, Blegbie	do.		1 0 0
	Adam Smith, Stevenson Mains	One-year-old Colt	L.3 & Med. Sil. Med.	2 10 6
	Robert Ainslie of Elvingston	do.		1 0 0
	Alex. Wyllie, Bolton	do.		0 10 0
	Alex. Stewart, Meiklerigg	Two-year-old Filly	L.3 & Med. Sil. Med.	3 10 6
	Earl of Wemyss	do.		2 0 0
	Robert Taylor, Carfrae	do.		1 0 0
	Adam Smith, Stevenson Mains	One-year-old Filly	L.2 & Med. Sil. Med.	2 10 6
	Adam Smith, Stevenson Mains	do.		1 0 0
	J. L. Guild, Balgone Barns	do.		0 10 0
Inverness	Miss Elizabeth Murray, Bellfield	Two-year-old Filly	L.3 & Med. Sil. Med.	3 10 6
	William Chisholm, Barnyards	do.		2 0 0
		Carry forward,		L.269 7 6

NAME OF DIST.	PREMIUM AWARDED TO	FOR	AMOUNT,		
		Brought forward, .	L.269	7	6
Inverness	William Fraser, Lairgs	Two-year-old Filly . . .	1	0	0
	Evan Baillie of Dochfour	One-year-old Filly L.1 & Med. Sil. Med.	1	10	6*
	Robert Mather, Druid Temple	do.	0	10	0*
Island of Skye	Dr Nicol Martin, Glendale	One-year-old Colt L.1 & Med. Sil. Med.	1	10	6*
	Rev. D. M'Callum, Dunvegan	do.	0	10	0*
	John Campbell, Dunvegan	Two-year-old Filly L.1 10s. & Med. Sil. Med.	2	0	6*
	Malcolm Ross, Fosach	do.	1	0	0*

SHEEP.

Annandale, including Parish of Kirk-michael	John A. Johnstone, Arehbank	Cheviot Tup Silver Medal	0	16	0
	James Brydon, Kinnelhead	do. L.3 & Med. Sil. Med	3	10	6
	James Johnstone, Hunterheck	do.	1	0	0
	James Brydon, Kinnelhead	do.	0	10	0
	Thomas Welsh, Ericstane	Cheviot Shearling Tup L.3 & Med. Sil. Med.	3	10	6
	John A. Johnstone, Archbank	do.	1	0	0
	James Johnstone, Capplegill	do.	0	10	0
	Thomas Welsh, Ericstane	Cheviot Ewes LI. 10s. Med. & Sil. Med.	2	0	6*
	Thomas Welsh, Ericstane	do.	0	10	0*
	James Brydon, Kinnelhead	Cheviot Gimmers L.3 & Med. Sil. Med.	3	10	6
	Thomas Welsh, Ericstane	do.	1	0	0
	John Carruthers, Kirkhill	do.	0	10	0
Border Union	James Nisbet, Lambden	Border Leicester Tup L.3 & Med. Sil. Med.	3	10	6
	James Nisbet, Lambden	do.	1	0	0
	William Riddell, Hundalee	do.	0	10	0
	Alex. Bell, Linton	Border Leicester Shear. Tup L.3 & Med. Sil. Med.	3	10	6
	Samuel Jack, Mersington	do.	1	0	0
	Alex. Bain, Legars	do.	0	10	0
	James Nisbet, Lambden	Border Leicester Ewes L. 3 & Med. Sil Med.	3	10	6
	Representatives of late Thomas Wilson, Haymount	do.	1	0	0
	John Henderson, Cornhill	do.	0	10	0
	William Purves, Burnfoot	Border Leicester Gimmers L.3 Med. Sil. Med.	3	10	6
	John Henderson, Cornhill	do.	1	0	0
	Robert Kay, Linton Bankhead	do.	0	10	0
Selkirk	Duke of Buccleuch	Leicester Tup L.3 & Med. Sil. Med.	3	10	6
	William Scott, Howford	do.	1	0	0
	Thomas Mitchell, Hutlerburn	do.	0	10	0
	John Scott, Deloraine	Cheviot Shearling Tup L.3 & Med. Sil. Med.	3	10	6
	John Scott, Deloraine	do.	1	0	0
	John Mitchell, Singlee	do	0	10	0
	William Hall, Midgehope	Cheviot Ewes L.3 & Med. Sil. Med.	3	10	6
	John Mitchell, Singlee	do.	1	0	0
	John Scott, Deloraine	do.	0	10	0
	John Mitchell, Singlee	Cheviot Gimmers L.3 & Med. Sil. Med.	3	10	6
	William Hall, Midgehope	do.	1	0	0
	Gideon T. Scott, Hyndhope	do.	0	10	0
Badenoch and Rothie-murchus	Donald Stewart, Chapelpark	Blackfaced Tup Silver Medal	0	16	0
	P. D. Robertson, Etteridge	do. L.3 & Med. Sil. Med.	3	10	6
	Roderick Macgregor, Kincraig	do.	1	0	0
	Donald Stewart, Chapelpark	do.	0	10	0
	P. D. Robertson, Etteridge	Blackfaced Shearing Tup L.3 & Med. Sil. Med	3	10	6
	John Kennedy, Soillerie	do.	1	0	0
	Donald Stewart, Chapelpark	do	0	10	0
	Donald Stewart, Chapelpark	Blackfaced Ewes L.3 & Med. Sil. Med.	3	10	6
	A. Campbell, Gaskbeg	do.	1	0	0
	Roderick Macgregor, Kincraig	do.	0	10	0
	Roderick Macgregor, Kincraig	Blackfaced Gimmers L.3 & Med. Sil. Med.	3	10	6
	A. Campbell, Gaskbeg	do.	1	0	0
	A. Macrae, Ruthven	do.	0	10	0
		Carry forward, .	L.356	19	0

* Half Premiums awarded, the number of Lots being under four.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.		
		Brought forward,		L.356	19	0
Sutherland	Duke of Sutherland	Cheviot Tup	Silver Medal	0	16	0
	M. Gunn, Culgower	do.	L.3 & Med. Sil. Med.	3	10	6
	M. Gunn, Culgower	do.		1	0	0
	J. B. Dudgeon, Crakaig	do.		0	10	0
	W. Mitchell, Pulrossie	Cheviot Shearling Tup	L.3 & Med. Sil. Med.	3	10	6
	Marshall & Scott, Clebrig	do.		1	0	0
	W. Mitchell, Pulrossie	do.		0	10	0
	J. B. Dudgeon, Crakaig	Cheviot Ewes	L.3 and Med. Sil. Medal	3	10	6
	J. B. Dudgeon, Crakaig	do.		1	0	0
	W. Mitchell, Pulrossie	do.		0	10	0
	J. B. Dudgeon, Crakaig	Cheviot Gimmers	L.3 and Med. Sil. Med.	3	10	6
	W. Mitchell, Pulrossie	do.		1	0	0
	M. Gunn, Culgower	do.		0	10	0
West Lothian	Charles Gordon of Hallmyre	Blackfaced Tup	Silver Medal	0	16	0
	Thomas Shaw, Auston	do.	L.3 & Med. Sil. Medal	3	10	6
	Patrick Melrose, West Loch	do.		1	0	0
	Patrick Melrose, West Loch	do.		0	10	0
	Patrick Melrose, West Loch	Blackfaced Shearling Tup	L.3 & Med. Sil. Med.	3	10	6
	Patrick Melrose, West Loch	do.		1	0	0
	Patrick Melrose, West Loch	do.		0	10	0
	Patrick Melrose, West Loch	Blackfaced Ewes	L.3 & Med. Sil. Med.	3	10	6
	Thomas Shaw, Auston	do.		1	0	0
	Patrick Melrose, West Loch	do.		0	10	0
	James J. Currie, Yorkston	Blackfaced Gimmers	L.3 & Med. Sil. Med.	3	10	6
	Thomas Shaw, Auston	do.		1	0	0
	Patrick Melrose, West Loch	do.		0	10	0
West Lothian and Eastern Portion of Stirlingshire	Thomas L. Learmonth of Parkhall	Leicester Tup	Silver Medal	0	16	0
	Joan Morrison, Dalkeith	do.	Med. Sil. Medal	0	10	6
	John Hill, Carlowrie	Leicester Shear. Tup	Med. Sil. Medal	0	10	6
	John Hill, Carlowrie	Leicester Ewes	Med. Sil. Medal	0	10	6
	John Hill, Carlowrie	Leicester Gimmers	Med. Sil. Medal	0	10	6
Fife	Earl of Dalhousie	Leicester Tup	Silver Medal	0	16	0
	John Taylor, Redcastle	do.	Med. Sil. Medal	0	10	6
	Charles Lyall, Old Montrose	Leicester Shear. Tup	Med. Sil. Medal	0	10	6
	David Edward, Charleton	Leicester Ewes	Med. Sil. Medal	0	10	6
	Charles Lyall, Old Montrose	Leicester Gimmers	Med. Sil. Medal	0	10	6
West Perthshire	William Grieve, Skelfhill	Cheviot Tup	Med. Sil. Medal	0	10	6
	James Grieve, Branxholm Braes	Cheviot Shear. Tup	Med. Sil. Medal	0	10	6
Broadalbane	John Hamilton, Comrie	Blackfaced Tup	Med. Sil. Medal	0	10	6
	A. & J. M'Naughton, Ferrenmore	Blackfaced Shear. Tup	Med. Sil. Medal	0	10	6
	John [illegible], Glenlochay	Blackfaced Ewes	Med. Sil. Medal	0	10	6
	John Wilson, Glenlochay	Blackfaced Gimmers	Med. Sil. Medal	0	10	6
				L.407	14	0

SPECIAL GRANTS.

Edinburgh Caledonian Club	Vote in aid of Premiums		50	0	0
	Sir G. Graham Montgomery, Bart., M.P.	Highland Society	Med. Gold Medal	6	2	0
			L.56	2	0
Ayrshire	Vote to Dairy Produce Show at Kilmarnock		20	0	0
Peat Society	Vote in aid of Premiums		20	0	0
Forestry Society	Vote in aid of Premiums		3	0	0
			L.99	2	0

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

ABERDEENSHIRE.

NAME OF SOCIETY.	MEDAL AWARDED TO	FOR
Auchindoir, Kildrummie, and Towie	William Walker, Ardhuncart	Polled Bull
	Peter Cran, Old Morlich	Polled Cow
	David Baillie, Mains of Rhynie	Shorthorn Bull
	David Baillie, Mains of Rhynie	Shorthorn Cow
Cromar, Upper Dee and Donside	Lewis Paterson, Groddie	Shorthorn Bull
	John Begg, Lochnagar	Shorthorn Cow
	George Reid, Smiddyhill	Polled Bull
	Marquis of Huntly	Polled Cow
Ebrieside	John Grant, Methlic	Polled Heifer
	James Sim, Newton of Methlic	Draught Mare
	Robert Kilgour, Ardlin	Leicester Shearling Tup
	Robert Kilgour, Ardlin	Dorking Chickens
Formartine	William S. Marr, Upper Mill	Shorthorn Bull
	Alex. Davidson, Mains of Cairnbrogie	Shorthorn Cow
Fyvie	James Durno, Eastertown	Draught Mare
	William Mackie, Petty	Shorthorn Heifer
Insch	Mrs Moir, Mains of Wardhouse	Cured Butter
	Mrs Sharp, Petersfield	Poultry
Keig	Miss E. Taylor, Fiennie	Dorking Fowls
	Mrs Smith, Mains of Whitehouse	Fresh Butter
Kincardine-O'Neil and Upper Deeside	Mrs A. Niven, Craigmyle Mills	Silver Dorkings
	Mrs F. Davie, Mid-Beltie	Bramahs
	James Philip, Crofts	Spanish Poultry
	William Adam, Inchley	Cross Chickens
	Mrs F. Davie, Mid-Beltie	Sweet Milk Cheese
	Mrs F. Davie, Mid-Beltie	Salt Butter
	Mrs A. Niven, Craigmyle Mills	Oatmeal Cakes
Kinnethmont	James Middleton, Newtonhill	Shorthorn Bull
	Peter Bruce, Myreton	Shorthorn Cow
	Hugh Gordon Lumsden of Clova	Polled Bull
	Peter Beattie, Dunnydeer	Polled Cow
	Peter Beattie, Dunnydeer	Draught Mare
Mar	David Burness, Boghead	Shorthorn Bull
	Silvester Campbell, Kinellar	Shorthorn Cow
	William M'Combie of Easter Skene	Polled Heifer
	John Spring, Auchencloch	Draught Mare
North-East Aberdeenshire	James Smith, Burnshangie	Polled Bull
	William Cruickshank, Cairnglass	Shorthorn Cow
	James Morrison, Milton, Phingask	Draught Mare
	Mrs William Watson, Skelmanca	Dairy Produce
	Robert Chapman, Poukburn	Collection of Seeds
	Robert Chapman, Poukburn	Collection of Roots
North of Scotland Root, Vegetable, and Fruit Association	John Gordon of Cluny	Collection of Turnips
	Robt. Ironside, Ingliston	Collection of Potatoes
	Alex. Beddie, Newlandshill	Shorthorn Bull
	Alex. Beddie, Newlandshill	Polled Cow
Vale of Alford	Wm. M'Combie of Tillyfour, M.P.	Swedish Turnips
	Wm. Yool, Glenlogie	Yellow Turnips
Warthill	William Leslie of Warthill	Green Crop (Heavy Land)
	Alex. Auld, Newton Rothmaise	Green Crop (Light Land)

ARGYLLSHIRE.

Kintyre	John Gilchrist, Ballyvain	Ayrshire Bull
	Robt. Clark, Skeroblin	Brood Mare
	J. N. Fleming of Keil	Blackfaced Tup
	John Smith, Balnaglaick	Sweet Milk Cheese

AYRSHIRE.

Carrick	J. N. Fleming of Knockdon	Brood Mare
	Thomas Crawford, Drumbeg	Draught Gelding
	John Anderson, Shankston	Cheese
	John & Thomas Semple, Glenlnie	Cured Butter
Coylton and Stair	John Ritchie, Broadwood	Ayrshire Cow
	Matthew Mair, Shalloch	Draught Mare

NAME OF SOCIETY.	MEDAL AWARDED TO	FOR
Craigie	Alex. Mackie, Heughmill	Ayrshire Bull
	Thomas Lindsay, Townend	Ayrshire Cow
	James Kilpatrick, Craigie Mains	Draught Mare
Dalry	John Brown, Lissens Moss	Ayrshire Bull
	Andrew Allan, Munnoch	Ayrshire Cow
Dundonald	Hon. G. R. Vernon, Auchans House	Ayrshire Bull
	John Caldwell, Ploughland	Ayrshire Cow
Irvine	David Stevenson, Irvine Mains	Ayrshire Cow
	James & Gavin Chambers, Cranberry Moss	Clydesdale Stallion
Kilmarnock	Duke of Buccleuch and Queensberry	Ayrshire Bull
	William Duncan, Brockwellmuir	Ayrshire Cow
	William Wyllie, Fenwick	Clydesdale Stallion
Kirkmichael	Quintin Kerr, Dowanston	Brood Mare
	John Rankine of Beoch	Ayrshire Bull
	William Anderson, Barneil	Ayrshire Cow
	William Anderson, Barneil	Ayrshire Heifer
Loudoun	John Semple, Bransfield	Ayrshire Bull
	David Gilchrist, Parkiston	Ayrshire Cow
Muirkirk	Patrick Wardrope, Garlaff	Ayrshire Bull
	R. M'Cormick, Braehead	Ayrshire Cow
	James Wilson, Old Mill	Clydesdale Mare
	John Fleming, Ploughland	Blackfaced Tup
	Gavin Moffat, Burnfoot	Collection of Roots
	Gavin Moffat, Burnfoot	Sweet Milk Cheese
New Cumnock	R. & P. Wardrope, Garlaff	Ayrshire Bull
	Ivie Campbell, Craigmar	Ayrshire Cow
	James Craig, Polquheys	Clydesdale Mare
	James Craig, Polquheys	Blackfaced Tup
Symington	Alex. Stuart, Muirhouse	Ayrshire Bull
	Alexr. Paton, Stonecalsey	Ayrshire Cow
	BANFFSHIRE.	
Central Banffshire	T. F. Inkson, Kinermony	Polled Bull
	P. Inkson, Berryleys	Shorthorn Heifer
	James Lumsden, Braco	Draught Mare
	T. F. Inkson, Kinermony	Oats
	Robert Turner, Brankanentham	Barley
	Mrs Longmore, Netherton	Cured Butter
	BERWICKSHIRE.	
Lammermoor	James Harper, Snawdon	Cheviot Gimmers
	Duke of Roxburghe	Blackfaced Gimmers
	DUMBARTONSHIRE	
Dumbartonshire	Alex. Buchanan, Garscadden Mains	Clydesdale Mare
	David Riddell, Kilbowie	Clydesdale Entire Colt
	Archd. Coubrough, High Craigton	Blackfaced Tup
	Archd. Coubrough, High Craigton	Blackfaced Ewe
Western District of Dumbarton	James Glen, Rossbank	Clydesdale Stallion
	Duncan Macfarlane, Torr	Clydesdale Mare
	DUMFRIESSHIRE.	
Annandale	Robert Jardine of Castlemilk	Galloway Bull
	James Jardine, Dryfeholm	Shorthorn Bull
	Robert Drummond, Millbank	Ayrshire Cow
	James Cunningham, Tarbreoch	Cross Hoggs
Nithsdale	George Douglas, Highland	Sweet Milk Cheese
	James Hiddleston, Bankhead	Cured Butter
Sanquhar	William Smith, Chanlockfoot	Ayrshire Bull
	Duke of Buccleuch and Queensberry	Ayrshire Heifer
	Thomas Kerr, Whitehill	Draught Mare
	Samuel Irving, Careo	Cheviot Ewe Hogg

Edinburghshire.

NAME OF SOCIETY.	MEDAL AWARDED TO	FOR
Dalkeith	James Lawrie, Mitchelston	Brood Mare
	James Currie, Halkerston	Shorthorn Cow
	William Ritchie of Middleton	Leicester Tup
	Mrs C. J. M. Finnie, Swanston	Boar
	Thomas Proudfoot, Pinkiehill	Chevalier Barley
	James Wilson, Wester Cowden	Early Angus Oats

Fifeshire.

Auchtermuchty	A. H. Tyndall Bruce of Falkland	Shorthorn Heifer
	A. H. Tyndall Bruce of Falkland	Clydesdale Mare
	A. H. Tyndall Bruce of Falkland	Leicester Tup
	James Thom, Pitlochie	Green Crop
	James Tod, Easter Cash	Hay Crop
Dunnikier	James T. Oswald of Dunnikier	Shorthorn Bull
	James Thomson, Dysart	Dairy Cow
	John Williamson, Bogie Mains	Brood Mare
Kinglassie	John Braid, North Pitkinnic	Shorthorn Bull
	George Gibb, Pitteuchar	Clydesdale Mare

Inverness-shire.

Strathspey	Earl of Seafield	Highland Bull
	Earl of Seafield	Highland Heifer
	Alex. Cameron, Mains of Garten	Farm Management
	John M'Gillivray, Croftmore	Green Crop
	Charles Grant, Advie	Collection of Roots

Kincardineshire.

Strachan	John Masson, Mill of Cammie	Collection of Roots
	William Reid, Kirkton	Poultry

Kinross-shire.

Kinross-shire	James Hutton of Waulkmill	Shorthorn Bull
	James Walls, Lochran	Clydesdale Mare

Lanarkshire.

Calder Waterhead	John Meikle, Seafield	Ayrshire Bull
	John Watson, Glencairn House	Clydesdale Entire Colt
Upper Ward of Lanarkshire	Robert Weir, Brownhill	Draught Mare
	William Purdie, Millands	Leicester Ewe Lamb

Linlithgowshire.

Bathgate	James Shields, Byers	Shorthorn Bull
	John Meikle, Seafield	Ayrshire Bull
	Ralph Stark, Camelon	Clydesdale Gelding
	T. L. Learmonth, Parkhall	Border Leicester Tup
Biggar	John Gibb, Biggarshiells	Cheese

Nairnshire.

Nairnshire	James M'Kessack, Earnside	Polled Cow
	William A. Fraser, Brackla	Chevalier Barley
	John Joss, Budgate	Fine Fellow Oats
	Wm. C. Clark, Little Brightmony	Rye-Grass Seeds
	Alex. Falconer, Rereach	Collection of Roots

Perthshire.

Dunning	Jane Whyte, Baadhead	Cured Butter
Moulin	William Stewart, Achlat	Turnips
Strathearn (Central)	Robert Gardiner, Chapelbank	Clydesdale Mare
	John Whyte, Muirhead	Leicester Shearling Tup
	Patrick Gardiner, Newbiggin	Common Barley
Upper Strathearn	Robert Young, Bellyclone	Shorthorn Bull
	Robert Gardiner, Chapelbank	Clydesdale Mare
	John Martin, Newbigging	Blackfaced Tup

RENFREWSHIRE.

Lower Ward of Renfrewshire	Sir M. R. Shaw Stewart of Blackhall, Bart.	Ayrshire Bull
	Arthur Lang, West Kilbride	Ayrshire Cow
	John Simpson, Tourgill	Blackfaced Tup
	Donald Black, Auchengoyle	Blackfaced Ewes
Mearns	James Mitchell, Blackhouse	Ayrshire Cow
	John Carslaw, Humby	Draught Gelding

ROSS-SHIRE.

Easter Ross	John Robertson of Rhynie	Wheat
	Thos. Anderson, Monikiln	Barley
	Niel Scobie, Fearn	Oats
	John Robertson of Rhynie	Ryegrass

STIRLINGSHIRE.

Bucklyvie and Gartmore	W. A. Maclachlan of Auchentroig	Ayrshire Cow
	James Risk, Gowston	Brood Mare

WIGTOWNSHIRE.

Kirkmaiden	Andrew Lockhart, Garroehtrie	Turnips

174 Medium Silver Medals, L.91, 7s. 0d,

PLOUGHING COMPETITIONS.

In 1874–75 the Society's Silver Medal was awarded at 183 Ploughing Competitions as follows:—

ABERDEENSHIRE.

NO.	NAME OF SOCIETY	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
1.	Aboyne.	Aboyne Castle Home Farm.	James Gauld, Whitehouse.
2.	Belhelvie.	Keir.	Charles Duncan, Balmedie House.
3.	Buchan (Deer District).	Bruxie.	James Michie, Blackslack.
4.	Buchan (Fraserburgh Dist.)	Crimmonmogate.	Andrew Quirie, Auchtygills.
5.	Coldstone and Migvie.	Blelack.	James Dawson, Tilliepronie.
6.	Countesswells.	Gairn.	Robert Fraser, Bishopdams.
7.	Crathie.	Tynabaich.	Charles Stables, Abergeldie.
8.	Drumblade.	Shach.	Wm. Gammie, Knightsmill.
9.	Ebrieside.	Cairnadelly.	William Smith, Lintrigs.
10.	Fintray.	Home Farm, Fintray House.	John Cowie, Newlands.
11.	Forgue.	Mains of Bogrie.	John Gordon, Comisty.
12.	Glenmuick.	Pananich.	James Sim, Crofts of Glenmuick.
13.	Kinnethmont and Leslie.	Johnston.	John Thomson, Sunnyside.
14.	North-East Aberdeenshire.	Towie of Auchmedden.	William Birnie, Chapelton.
15.	Peterculter and Drumoak.	Newton of Drum.	Adam Brown, Upper Anguston.
16.	Strathbogie.	Pirries' Mill	Charles Milne, Corse of Kininvie.
17.	Strichen.	Auchorthie.	James Burnett, Strichen Mains.
18.	Tough and Lynturk.	Blackpool.	William Christie, Little Lynturk.

ARGYLLSHIRE.

19.	Ardnamurchan.	Kilchoan.	Dnn. M'Pherson, Branault.
20.	Glenorchy.	Dalmally.	John Campbell, Corryghoil.
21.	Islay, Jura, and Colonsay.	Skerrols.	William Campbell, Islay House.
22.	Kilfinan.	Drum.	John Spiers, Point Farm.
23.	Killean and Kilcalmonell.	Dalmore.	Samuel Thomson, Dalmore.
24.	Kintyre.	Knockrioch.	Alex. Ronald, Pennysaraeh.
25.	Lorn.	Aehnaba.	Dugald Campbell, Stonefield.
26.	Mull.	Kilichronan.	Neil M'Lean, Glenforsa.

AYRSHIRE.

27.	Ayr and Alloway.	Maronhill.	James Murdoch, Knocksoul.
28.	Coylton.	Barclaugh.	John Thom, Corsehill.
29.	Dalry.	Blairland.	Robert Brown, Lyleston.
30.	Dalrymple.	Dustyhill.	James M'Kie, Burneil.
31.	Galston.	Little Maxwood.	James Craig, Overland.

NO.	NAME OF SOCIETY	PLACE OF COMPETITION	SILVER MEDAL AWARDED TO
32.	Kilmarnock.	Onthank.	Hugh White, Wraes.
33.	Kirkmichael.	Barneil.	Thomas Lennox, Goosehill.
34.	Kirkoswald.	North Threave.	William Ramsay, Balvaird.
35.	Loudoun and Lanfine.	Dalwhatswood.	John Steel, Newton.
36.	Monkton.	Brieryside.	James Guthrie, Townhead.
37.	New Cumnock.	Old Mill.	Wm. Millar, Whitehill.
38.	Oehiltree.	Clydenoch.	Robert Osborne, Lochmark.
39.	Sorn and Dalgain.	Daldoreh.	Charles Baird, North Blairkipp.
40.	Straiton.	Shankston.	Thomas M'Ilwraith, Meadowhead.
41.	Tarbolton.	Coilsfield.	Robert Neill, West Doura.
42.	West Kilbride.	West Kilbride.	George Halbert, Braid.
		BANFFSHIRE.	
43.	Avonside.	Craggaumore.	Alex. M'Kenzie, Lagmore.
44.	Keith.	Maisley.	Alex. M'William, Netherton.
		BERWICKSHIRE.	
45.	Cockburnspath.	Eeelie.	Archibald Paterson, Old Cambus.
46.	Eeeles.	Wormerlaw.	Ralph Coulter, Wormerlaw.
47.	Lammermoor.	Burnhouses.	Robert Marshall, Cockburn.
48.	Westruther.	Thornidyke.	Robert Hill, Dods.
		BUTE AND ARRAN.	
49.	Arran.	Glenkill.	Angus M'Killop, Tormore.
50.	Bute.	Meikle Kilmory.	Ninian Duncan, Birgadale.
		CAITHNESS-SHIRE.	
51.	Caithness.	Thurso East Home Farm.	James Murray, Barrock Mains.
		CLACKMANNANSHIRE.	
52.	Hillfoots.	Hillend.	James Reid, Dollarbeg.
		DUMBARTONSHIRE.	
53.	Cumbernauld.	Airdriehead.	John Allan, Westerwood.
54.	Kilmaronock and Bonhill.	Ladrishbeg.	Walter Bilsland, Mains.
55.	Kirkintilloch.	Drumbreck.	John Faulds, Wallflat.
		DUMFRIESSHIRE.	
56.	Canonbie.	Barraserofts.	Thomas Thompson, Stobbs.
57.	Glencairn.	Ingleston Mains.	James Weir, Gordiestone.
58.	Mid-Nithsdale.	Thornhill.	William Campbell, New Cample.
59.	Westerkirk.	Midknoek.	John Little, Georgefield.
		EDINBURGHSHIRE.	
60.	Currie.	Newmills.	David Hook, Shothead.
61.	Gleneross.	Easter Howgate.	Alex. Penicuick, Fulford.
62.	Lasswade.	Goukly Moss.	James Hunter, South Melville.
63.	Mid-Lothian.	Parduvine.	William Brown, Inverleith Mains.
64.	Penieuik.	Eastfield.	William Stewart, Mount Lothian.
65.	Temple.	Outerston.	Thomas Leadbetter, Outerston.
66.	West Calder.	Langside.	Thomas Graham, Rosebank.
		ELGINSHIRE.	
67.	Central Morayshire.	Carsewell.	Geo. Cobban, Newton of Struthers.
68.	Cromdale.	Balchule.	John Stewart, Rhynoballoch.
69.	Dallas.	Easter Kellas.	Alex. Edwards, Mosstowie.
70.	Edinkillie.	Dumphail.	George Cobban, Outlawell.
71.	Elgin (Western District).	Braemoriston.	Alex. Edward, Woodside.
72.	Knockando.	Overtown.	J. Smith, Macallan.
73.	Rafford.	Cluny.	George Cumming, Phorp.
74.	Rothes and Speymouth.	Dipple.	James Innes, Dipple.
75.	Spey, Avon, and Fiddochside.	Ballindalloch.	Adam Green, Alnaboil.
76.	Strathspey.	Castle Grant.	Donald M'Queen, Dell.
77.	Urquhart.	Newton.	Eric Mackenzie, Stonewells.

FIFESHIRE.

NO.	NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
78.	Crossgates.	Cuttlehill.	David Addison, Cuttlehill.
79.	Dunnikier.	Bogie.	Andrew Wright, Dunnikier.
80.	Howe of Fife.	Braeside of Cults.	John Lawson, Pitlessie Mill.
81.	Largo.	Largo Place.	Robt. Tivendall, jun., New Pilmuir.
82.	Leslie.	Wester Finglassie.	David Leighton, Farmlands.
83.	North of Fife.	Parbroath.	James Kinnear, Luthrie Bank.

FORFARSHIRE.

84.	Dundee Mains & Strathmartine.	St Marys.	David Jackson, Baldragon.
85.	Tannadice and Oathlaw.	Milton of Finavon.	Alex. Donald, Nether Balgillio.

INVERNESS-SHIRE.

86.	Abernethy.	Tombea.	Donald Cameron, Cullachie.
87.	Badenoch.	Invertromie.	Angus M'Donald, Craig Dhu.
88.	Duthil.	Lynchurn.	Duncan Grant, Knock.
89.	Glen-Urquhart.	Shewglie.	Wm. Lawrence, Balmacaan.
90.	Inverness.	Castle Heather.	Alex. Gray, Cradlehall.
91	Strathdearn.	Dell.	Joseph Munro, Dalmigavie.
92.	Strathglass.	Easter Crochell.	Lewis Beaton, Guisachan.
93.	Strathnairn.	Galcantray.	James M'Pherson, Nairnside.

KINCARDINESHIRE.

94.	Banchory Ternan.	Cairniewhin.	Thomas Donald, Crathes Castle.
95.	Durris.	Spyhill.	Charles M'Hardy, Cairnfauld.
96.	Muchalls and Cookney.	North Cookney.	Wm. Milne, Wyndford.
97.	Netherley and Rickarton.	Borrowfield.	George Milne, Craigwells.
98.	Nigg.	Torry.	James Forrest, Kincorth.
99.	Portlethen.	Cansey Port.	James Wood, Cairnrobin.
100.	Rickarton and Urie.	Urie.	Andrew Knowles, Cowhill.
101.	Strachan.	Waulkmill.	Robert Shepherd, Haugh.

STEWARTRY OF KIRKCUDBRIGHT.

102.	Glenkens.	Newfield, Dalry.	William Clarkson, Tower.
103.	Kirkcudbright.	Cannee.	Anthony Guffog, High Borgue.
104.	Kirkpatrick Durham.	Whitecairn.	William Douglas, Brockloch.
105.	New Abbey.	Maxwellbank.	David Young, Woodhead.
106.	Penningham, Minnigaff, &c.	Barholm Mains.	John Monteith, Machermore Mains.

LANARKSHIRE.

107.	Cadder.	Gandloch.	Wm. Ballantyne, Kenmure.
108.	Calderwaterhead.	Swinstie.	Stewart Smith, Overjohnston.
109.	Carnwath.	Gallowhill.	John Ritchie, jun., Whitecastle.
110.	East Kilbride.	Howbank.	Robert Williamson, Drips.
111.	Hamilton.	Wellbrae.	Stewart Smith, Neilsland.
112.	Hamilton, Blantyre, &c.	Whitehills.	Samuel Neil, Torbanehill.
113.	New Monkland.	Rochsolloch.	William Muir, Mosside.
114.	Old Monkland.	Westerhouse.	Alex. Munn, Gartsherrie.
115.	Wiston and Roberton.	Shillawhead.	John Ireland, Hardington Mains.

LINLITHGOWSHIRE.

116.	Blackburn.	Murrayfield.	John Cruickshanks, Standhill.
117.	Kinneil.	Rousland.	James Wardlaw, Balderston.
118.	West Lothian.	West Binny.	Alex. Gray, Threemiletown.

NAIRNSHIRE.

119.	Ardclach.	Dulsie.	H. M'Kenzie, Remore.
120.	Nairnshire.	Balblair.	Alex. Campbell, Delnies.

ORKNEY.

121.	Burray.	Mains of Burray.	John Kennedy, Northfield.
122.	Evie and Rendall.	Quarrelbraes.	William Stickler, Manse of Evie.
123.	Rousay.	Saviskail.	James Sinclair, Sangskail.
124	Shapinsay.	Stye.	John Sclater, Balfour Mains.
125.	South Ronaldshay.	Sandwich.	John Annal, Farewell.

NO.	NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
126.	St Andrews.	Hall of Tankerness.	John Tait, Quoy Burray.
127.	Unst.	Hillside.	Hugh Inkster, Haroldswick.
128.	West Mainland.	Pow.	John Flett, Skail.
129.	Westray.	Brough.	George Drever, Cleat.

PEEBLES-SHIRE.

130.	Eddlestone.	Westloch.	James Richardson, Milkieston.
131.	Newlands.	Whitemuir.	Robert Graham, Hyndford.
132.	Peebleshire.	Wester Deanshouses	John Fleming, Darnhall, Eddlestone.
133.	West Linton.	Linton Bank.	Jas. Murray, Whitfield.

PERTHSHIRE.

134.	Ardoch.	Braco.	James Barclay, Bedfords.
135.	Arnprior.	Angus Step.	Duncan Dougall, Blaircessnock.
136.	Blair-Drummond, Ochtertyre, &c.	West Wood.	John More, Arnieve.
137.	Breadalbane (Eastern Dist.)	Boreland.	Duncan M'Intyre, Milton, Lawers.
138.	Bridge of Earn.	Moncrieffe.	Alex. Philip, Kilgraston.
139.	Callander.	Ballachanan.	Duncan Ferguson, Mollan.
140.	Comrie and Upper Strathearn.	West Tulybanocher.	James M'Dougall, Mailermore.
141.	Culross.	Comrie Mains.	James Wardlaw, Carniel.
142.	Drummond Castle.	Dargill.	George Nairn, Mains of Drum.
143.	Dunblane.	Cairnston.	Archd. M'Laren, Glenwhilk.
144.	Foss and Strathtummel.	Kynachan.	Archd. Ballantyne, Foss Home Farm
145.	Glenalmond.	Campsie.	Peter Comrie, Buchanty.
146.	Glenlyon.	Kerrowmore.	Donald Cameron, Roro More.
147.	Glenquaich.	Linmore.	James M'Farlane, Wester Kinloch.
148.	Logie and Leerop.	Mid Carse.	James Turnbull, Manorneuck.
149.	Madderty.	Parkside.	James Ritchie, Littlefold.
150.	Methven.	Craigend.	John Douglas, Clathy.
151.	Mid D.of Athole and Tullymet.	Meadows.	Peter Duff, Balantaylor.
152.	Monzievaird and Strowan.	Carse of Trowan.	William M'Kenzie, Balmuick.
153.	Moulin.	Tomdachoil.	John Stormont, Balnore.
154.	Port of Monteith.	Egin.	Daniel M'Rostie, Cardross.
155.	Rannoch.	Innerhadden.	Donald Robertson, Amat.
156.	St Martins.	Ballhill.	John Brown, Boghall.
157.	Strathbraan.	Deanshaugh.	William M'Duff, Ballinliek.
158.	Strathearn (Central).	Broadleys.	William Campbell, Chapelbank.
159	Struan, Glengarry, &c.	Blairfettie.	Duncan M'Gregor, Blair Manse.
160.	Thornhill	Ballinton.	Alex. Moir, Netherton.
161.	Upper Strathord.	Kinvaid.	John Malcolm, Spediehill.
162.	Weem.	Weem Hotel Farm.	William M'Lauchlan, Balnearn.

RENFREWSHIRE.

163.	Catheart and Eastwood.	Eastwood Park.	Robert Watson, Sheep Park.
164.	Erskine.	Hairshaw.	William Brown, Newton.
165.	Greenock, Gourock, and Inverkip.	Langhill.	Robert Andrew, Maulkenhill.
166.	Kilbarchan.	Mains of Milliken.	James Brown, Manswrae,

ROSS-SHIRE.

167.	Black Isle.	Drumderfit.	Andrew M'Dougall, Munlochy.
168.	Easter Ross.	Culnaha.	Peter Smith, Balnagore,
169.	Kincardine and Creich.	Ardgay.	David Ross, Upper Gledfield.
179.	Tarbert.	Lower Seafield.	William Urquhart, Wilkhaven.
171.	Wester Ross.	Dunglust,	John Dingwall, Fodderty.

ROXBURGHSHIRE.

172.	Lilliesleaf.	Bewlie Mains.	Charles White, Spittal.
173.	West Teviotdale.	Ashybank.	Walter Brydon, Adderstoneshiels.

STIRLINGSHIRE.

NO.	NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO .
174.	Bannockburn, Plean, &c.	West Plean.	John M'Laren, Greenyards.
175.	Craigforth and Touch.	Old Mills.	William Bryson, Shaw of Touch.
176.	Eastern Dist. of Stirlingshire.	Rosehill.	Andrew Tennant, Inches.
177.	Strathendrick.	Barnford.	William Morrison, Drummore.

SUTHERLANDSHIRE.

178.	Lairg.	Balloan.	Alex. Gray, Culmaily.

WIGTOWNSHIRE.

179.	Kirkmaiden.	Mid Currochtree.	James Cochrane, Auchenught.
180.	Machars.	Drumrae.	John Fulton, Cruggleton.
181.	New Luce.	Milton.	Robert Lindsay, Milton.
182.	Old Luce.	Droughdove.	James McCarlie, Campbell's Croft
183.	Whithorn and Glasserton.	Balnab.	George Paterson, Craigdhu.

183 Minor Silver Medals, L.54, 18s.

V.—COTTAGES AND GARDENS.

1. BEST KEPT COTTAGES AND GARDENS.

EDINBURGHSHIRE.

Cramond	John Murray	Cottage	L.1 and Minor Silver Medal	L.1	6	0
	William M'Hardy	do.		0	10	0
	William Murray	do.	Minor Silver Medal	0	6	0
	James Palmer	Garden	L.1 and Minor Silver Medal	1	6	0
	David Whitelaw	do.		0	10	0
	William M'Hardy	do.	Minor Silver Medal	0	6	0

FIFESHIRE.

Newburgh	George Dowie	Cottage	L.1 and Minor Silver Medal	1	6	0
	John Young	do.		0	10	0
	William Coventry	do.	Minor Silver Medal	0	6	0
	John Young	Garden		1	0	0

KINCARDINESHIRE.

Fettercairn	David Carnegie	Cottage		1	0	0
	Alex. Stott	do.		0	10	0
	David Annandale	do.	Minor Silver Medal	0	6	0
	David Carnegie	Garden	L.1 and Minor Silver Medal	1	6	0
	James M'Leod	do.		0	10	0
	James Taylor	do.	Minor Silver Medal	0	6	0

LINLITHGOWSHIRE.

Dalmeny and Queensferry	David Robertson	Garden		1	0	0
	Benj. Miles	do.		0	10	0
	Mrs Proven	do.	Minor Silver Medal	0	6	0
Kirkliston	Thomas Paterson	Cottage	L.1 and Minor Silver Medal	1	6	0
	Hugh Borthwick	do.		0	10	0
	Alex. Kinnaird	do.	Minor Silver Medal	0	6	0
	John M'Kenzie	Garden	L.1 and Minor Silver Medal	1	6	0
	James Johnston	do.		0	10	0
	James Kirkhope	do.	Minor Silver Medal	0	6	0

PERTHSHIRE.

Dumbarney	John Sime	Cottage	L.1 and Minor Silver Medal	1	6	0
	John Campbell	do.		0	10	0
	Lawrence Dewar	do.	Minor Silver Medal	0	6	0
	Walter Taylor	Garden	L.1 and Minor Silver Medal	1	6	0
	Alex. Rattray	do.		0	10	0
	Lawrence Dewar	do.	Minor Silver Medal	0	6	0
				L.21	8	0

2. MEDALS FOR COTTAGES AND GARDENS AND GARDEN PRODUCE.

Medium Silver Medals were awarded to the following:—

ABERDEENSHIRE.

Cluny	George Macpherson	Cottage
	James Addison	Garden
Keig	Alex. Young	Cottage
	Lewis Stewart	Garden

AYRSHIRE.

Stewarton	Mrs Holburn	Cottage
	Richard Cameron	Garden

DUMBARTONSHIRE.

Vale of Leven and Dumbarton	John Keir	Garden
	Duncan M'Callum	Garden

EDINBURGHSHIRE.

Roslin	Alex. M'Gregor	Garden and Garden Produce
	Peter Torrance	Flower Plot

FIFESHIRE.

Auchtermuchty and Strathmiglo	Henry P. Anderson	Garden
	William Stevenson	Garden Produce

LANARKSHIRE.

Shettleston	John Stodart	Vegetables
	John Stodart	Flowers

LINLITHGOWSHIRE.

Ecclesmachan	John Stirling	Cottage
	James Henderson	Garden

16 Medium Silver Medals, L.8, 8s.

VI. VETERINARY DEPARTMENT.

ANNUAL EXAMINATION—APRIL 1875.

Israel Print, Little Wolford,	General Examination,	Med. Gold Medal,	L.6	2	0
W. W. MccGwire, Dungarvan,	Praetical Examination,	Med. Gold Medal,	6	2	0

CLASS EXAMINATIONS—APRIL 1875.

EDINBURGH VETERINARY COLLEGE.

John Jones, Mallow,	Horse Pathology,	Silver Medal,	0	16	0
W. E. M'Cracken, Craglemine	Cattle Pathology,	Silver Medal,	0	16	0
W. W. MccGwire, Dungarvan,	Anatomy,	Silver Medal,	0	16	0
W. E. M'Cracken, Craiglemine	Physiology,	Silver Medal,	0	16	0
Israel Print, Little Wolford,	Chemistry,	Silver Medal,	0	16	0
W. W. MccGwire, Dungarvan,	Medicine	Silver Medal,	0	16	0

NEW VETERINARY COLLEGE, EDINBURGH.

William Barnes, Tarporley, and Richard Roberts, Kendal,	Horse Pathology,	Silver Medal, Silver Medal,	0	16	0
Alex. Gunn, Balloan,	Cattle Pathology,	Silver Medal,	0	16	0
William Barnes, Tarporley,	Physiology,	Silver Medal,	0	16	0
Robert Moore, West Brunton,	Chemistry,	Silver Medal.	0	16	0

GLASGOW VETERINARY COLLEGE.

John H. Bryce, Stirling,	Medicine and Surgery (Horses),	Silver Medal,	0	16	0
George H. Elder, Coupar Angus,	Medicine and Surgery (Cattle, Sheep, &c.),	Silver Medal,	0	16	0
Thomas Giffen, Belfast,	Physiology	Silver Medal,	0	16	0
R. Muir, Paisley,	Examination of Horses as to soundness,	Silver Medal,	0	16	0
	Carry forward,		L.24	4	0

		Brought forward, .	L.24 4 0

CLASS EXAMINATIONS—JULY 1875.

NEW VETERINARY COLLEGE, EDINBURGH.

Henry Snarry, Malton,	Anatomy,	Silver Medal,	0 16 0
Henry Snarry, Malton,	Materia Medica,	Silver Medal,	0 16 0
James Sandeman,	Chemistry,	Silver Medal,	0 16 0

GLASGOW VETERINARY COLLEGE.

J. C. Atkinson, Manchester, and	Anatomy and Histology	Silver Medal,	0 16 0
Alex. Chivas, Peterhead,		Silver Medal,	0 16 0
J. C. Atkinson, Manchester,	Chemistry,	Silver Medal,	0 16 0
James Wilson, Douglas,	Materia Medica,	Silver Medal,	0 16 0
James Wilson, Douglas,	Botany,	Silver Medal,	0 16 0
			L.30 12 0

VII. AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

1. A. A. Ferguson, Gosfield, Essex, ...	L.6 0 0
2. J. J. Brown, Cumberland, ...	4 0 0
	L.10 0 0

ABSTRACT OF PREMIUMS.

1. ESSAYS AND REPORTS—Money Premiums and Medals, . . .			L.146 2 0
2. INVERNESS SHOW, 1874, ...			0 16 0
3. GLASGOW SHOW—Money Premiums and Medals, ...			2413 19 6
4. DISTRICT SHOWS:—			
Stock, ...	L.407 14 0		
Special Grants, ...	99 2 0		
Local Societies—Medals in aid of Premiums, given by (174), ...	91 7 0		
Ploughing Associations—Medals to (183), . .	54 18 0		
			653 1 0
5. COTTAGES AND GARDENS—Money Premiums and 18 Minor Silver Medals, L.21, 8s; 16 Medium Silver Medals, L.8, 8s., ...			29 16 0
6. VETERINARY DEPARTMENT—Medals to Students, ...			30 12 0
7. AGRICULTURAL CHAIR, EDINBURGH UNIVERSITY—Prizes to Class, .			10 0 0
			L.3284 6 6

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY

At 30th NOVEMBER 1875.

I.	Investments on Bonds—			
	Heritable Bonds,		£16,279 16	0
	Debenture Bond by Trustees of the Clyde Navigation,		1,000 0	0
	Railway Debenture Bonds,		6,950 0	0
			£24,229 16	0
II.	Debenture Stock—			
	£3,000 North British Railway 4¼ per cent. Debenture Stock, at £106,		3,180 0	0
III.	Value of Bank Stocks at 30th November 1875—			
	£6,102, 7s. 8d. Royal Bank of Scotland Stock, at £227,	£13,852 8 2		
	2,218, 6s. 5d. Bank of England Stock, at £258,	5,723 3 4		
	2,000, 0s. 0d. British Linen Co. Bank Stock, at £295,	5,900 0 0		
	1,250, 0s. 0d. National Bank of Scotland Stock, at £315,	3,937 10 0		
	1,062, 10s. 0d. Commercial Bank of Scotland Stock, at £317,	3,368 2 6		
			32,781 4	0
	L.12,633, 4s. 1d.			
	Note.—The original cost of these Bank Stocks was £18,154, 9s. 8d., showing a profit at present prices of £14,626, 14s. 4d.			
IV.	Ten Shares (£500) of the British Fishery Society, valued at		200 0	0
V.	Arrears of Members' Subscriptions, considered Recoverable,		47 2	6
VI.	Sum in Deposit Receipt with Royal Bank of Scotland,		1,100 0	0
VII.	Balance Due by Royal Bank of Scotland on Account Current,		666 8	10
	Amount of Funds,		£62,204 11	4
VIII.	Building Fund—			
	1. Estimated Value of Buildings, No. 3 George IV. Bridge,		£3,100 0	0
	2. Sum invested in Railway Debenture Bond,		1,000 0	0
	3. Sum in Debenture Bond, by Trustees of the Clyde Navigation,		1,000 0	0
	Note.—This Bond of £1,000 is composed of—			
	Repayment of Advance to General Funds as in last year's Accounts,	£654 11 3		
	Interest thereon for year to 11th November 1875,	26 3 7		
		£680 14 10		
	Further Transfer from General Funds,	319 5 2		
		£1000 0 0		
	4. Deposit Receipt with Royal Bank of Scotland,		39 13	4
			£5,139 13	4
IX.	Furniture—			
	Estimated Value of Furniture, Paintings, Books, &c.,		£1,000 0	0

ANTHONY MURRAY, *Convener of Finance Committee.*
W. S. WALKER, *Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1.	BALANCE due by Royal Bank of Scotland at 30th November 1874,			£285	19 2
2.	ARREARS of Annual Subscriptions outstanding at 30th November 1874,	£45	18 6		
	Whereof due by Members who have since compounded for life, and thereby extinguished,	£3 17 0			
	Since ordered to be written off as irrecoverable,	16 14 0			
		20	11 0		
				25	7 6
3.	ARREARS from former Shows received—				
	Stirling,	£3	15 0		
	Inverness,	5	15 0		
				9	10 0
4.	INCOME FROM INVESTMENTS—				
	(1.) Interest on Heritable Bonds—				
	On £10,979 16 0 at 4 per cent.,	£439	3 8		
	1,300 0 0 at 4½ per cent,	58	10 0		
	£12,279 16 0	£497	13 8		
	4,000 0 0 lent at Martinmas 1875.				
	£16,279 16 0 Less Income Tax,	4	2 10		
		£493	10 10		
	(2.) Interest on Debenture Bonds—				
	On £10,500 at 4 per cent., £420 0 0				
	Less Income Tax, 3 10 0				
		416	10 0		
	Note.—£3,550 of these Bonds was paid at Martinmas 1875, and forms part of the above Investment of £4000 on Heritable Bonds.				
	(3.) Interest on £3,000 Debenture Stock at 4¼ per cent., £127 10 0				
	Less Income Tax, 1 1 3				
		126	8 9		
	(4.) Interest on Bank Account,	4	19 10		
		£1,041	9 5		
	Deduct Interest on £654, 11s. 3d. belonging to the Building Fund, at 4 per cent.,	26	3 7		
		£1,015	5 10		
	(5.) Dividends on Bank Stock—				
	£6,102 7 8 Royal Bank of Scotland, £579 14 8				
	2,218 6 5 Bank of England, 199 13 10				
	2,000 0 0 British Linen Co. Bank, 260 0 0				
	1,250 0 0 National Bank of Scotland, 200 0 0				
	1,062 10 0 Commercial Bank of Scotland, 159 7 6				
	£12,633 4 1	1,398	16 0		
	(6.) Dividend on £500 Stock of the British Fishery Society. *Note.*—No Dividend has been received for two years on this Stock.				
				2,414	1 10
5.	INCOME FROM BUILDING FUND—				
	Interest on Debenture Bond for £1,000 at 4 per cent., £40, less tax, 6s. 8d.,	£39	13 4		
	Interest on £654, 11s. 3d., due by the General Funds, at 4 per cent.,	26	3 7		
				65	16 11
6.	SUBSCRIPTIONS—				
	Annual Subscriptions,	£817	1 6		
	Life Subscriptions,	1,036	5 0		
				1,853	6 6
7.	SUBSCRIPTIONS to Chemical Department,			47	10 0
8.	DEBENTURE BOND with Caledonian Railway Co., paid up at Martinmas 1875,			3,550	0 0
9.	RECEIPTS from Glasgow Show (exclusive of premiums) per separate States,			5,730	3 7
	SUM OF CHARGE,			£13,981	15 6

AGRICULTURAL SOCIETY of SCOTLAND for the YEAR 1874-75.

DISCHARGE.

1.	ESTABLISHMENT EXPENSES, viz.—				
	Salary to Secretary for year to Martinmas 1875,			£850	0 0
	Clerk, £300; Junior Clerk, £137, 10s., for year to 1st October 1875,			437	10 0
	Messenger, £72, and allowance to Widow of former Messenger, £21,			93	0 0
				£1,380	10 0
	Feu-Duty, £28; Taxes, £35, 12s. 4d.; Water Duty, £1, 16s. 8d.,			65	9 0
	Coals and Coke, £9, 16s. 9d.; Gas, £6, 7s. 9d.; Insurance Premium, £3 17s. 6d.,			20	2 0
	Repairs and Furnishings, £27, 18s. 1d.; Sweeping Vents, £1, 7s.,			29	5 1
				£1,495	6 1
2.	FEE to Auditor of Accounts, for year to 30th November 1874,			50	0 0
3.	FEE to Practical Engineer for year to 1st July 1875,			20	0 0
4.	AGRICULTURAL CHAIR—				
	Grant to Professor Wilson, £150; Prizes to Class, £10,			160	0 0
5.	CHEMICAL DEPARTMENT—				
	Salary to Professor Dewar,			150	0 0
6.	VETERINARY DEPARTMENT—				
	Allowance to Professor Williams, £26, 5s.; Medals to Students, £30, 12s.,			56	17 0
7.	SOCIETY'S TRANSACTIONS—Printing, Binding, Posting, and Delivering Transactions,			422	2 7
8.	ORDINARY PRINTING and Lithographing, £96; Advertising, £39, 9s. 3d.; Stationery, Books, and Binding, £46, 19s. 7d.; Postage and Receipt Stamps, £43; Bank and Post-Office Charges and Telegrams, £6, 4s. 4d.,			231	13 2
9.	TRAVELLING AND HOTEL EXPENSES of Secretary to, from, and at London,			12	13 0
10.	SUBSCRIPTIONS to Public Societies—Scottish Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5,			25	0 0
11.	MISCELLANEOUS PAYMENTS—Reporting General Meetings, £3, 3s.; Handsels, £1, 4s. 6d.; Refreshments to Examiners, £1, 11s.; Repairing Dynamometer, £15, 7s.; Re-engraving Medals, £1, 4s. 6d.; Sundries, £1, 15s.,			24	5 0
12.	PREMIUMS—				
	Inverness Show, 1874,	£288 6 0			
	Glasgow Show, 1875,	2222 9 6			
	District Competitions, 1874,	662 10 0			
	Ploughing Competitions, 1874-75,	54 12 0			
	Vote to Edinburgh Christmas Club,	50 0 0			
	Vote to Ayrshire Agricultural Association,	20 0 0			
	Essays and Reports,	125 1 0			
				3,422	18 6
13.	FEES to Examiners and Expenses,			24	3 0
14.	ARREARS of Subscriptions to be struck off as irrecoverable,			33	12 6
15.	ARREARS of Subscriptions considered recoverable,			47	2 6
16.	CAPITAL SUMS lent on Bonds at Martinmas 1875,			6,000	0 0
17.	SUM in Deposit Receipt with Royal Bank,			1,100	0 0
18.	SUM in Deposit Receipt with Do. in name of Building Fund,			39	13 4
19.	BALANCE in Royal Bank of Scotland at 30th November 1875,			666	8 10
	SUM OF DISCHARGE,			£13,981	15 6

ANTHONY MURRAY, *Convener of Finance Committee.*
W. S. WALKER, *Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

EDINBURGH, *5th January* 1876.

ARSTRACT OF ACCOUNTS—

CHARGE.

1. Local Subscriptions—			
Voluntary Assessment on Proprietors—			
Lanarkshire,			£899 0 5
Ayrshire,			350 0 0
Renfrewshire,			109 5 0
Argyllshire,			200 0 0
Buteshire,			47 0 0
Glasgow—Contribution by City of Glasgow,			200 0 0
			£1,805 5 5
2. Amount Collected during the Show—			
Drawn at Gates,	£5,344 14 0		
Drawn at Horse Ring,	427 11 6		
Catalogues and Awards sold,	459 9 6		
			6,231 15 0
Rent of Stalls,			1,181 11 0
4. Rent of Refreshment Booths,			217 10 0
5. Rent of Attendants' Accommodation,			26 8 0
6. Manure in Show-Yard Sold,			20 0 0
7. Interest From Royal Bank,			52 16 0
8. Forfeited Deposit for Return of Horse and Fines,			2 12 6
			£9,537 17 11

GLASGOW SHOW, 1875.

DISCHARGE.

1. Show-Yard Expenditure—Fitting up, £2,105.—Inspecting Horse Ring Gallery, £14, 6s. 6d.—Loss of Pasturage on Glasgow Green, £6.—Plans, £5, 5s.—Japanned Hand-Lamps, &c., £3, 18s.—Blue Cord, £3, 15s.—Hire of Portable Boiler, £2, 10s.—Miscellaneous, £4, 5s. 6d.,	£2,145	0	0
2. Fodder and Bedding for Stock,	335	1	11
3. Police Force,	48	0	0
4. Travelling Expenses of Judges, Secretary, &c.,	161	17	8
5. Hotel and other Bills for Directors, Judges, Secretary, &c.,	357	8	11
6. Tickets for President's Dinner for do.,	45	2	6
7. Music in Show-Yard, at Dinner, &c.,	72	5	0
8. Printing Catalogues and Awards, and Lithographing Tickets, Badges, &c.	374	0	0
9. Advertising and Posting Bills,	88	6	2
10. Allowance to Local Secretary and Expenses, £32, 6s. 5d.—to Practical Engineer, £21.—and to Local Veterinary Inspector, £10,	63	6	5
11. Assistants, Porters, and Attendants,	80	1	1
12. Postage and Receipt Stamps,	30	0	0
13. Miscellaneous Outlays.—Carriage of Catalogues, Boxes, &c., £5, 15s. 8d., Telegrams, £1, 2s., Incidental Expenses, 7s.,	7	4	8
Amount of General Expenses,	£3,807	14	4
14. Premiums drawn at 30th November 1875,	2,222	9	6
	£6,030	3	10
Balance of Receipts,	3,507	14	1
	£9,537	17	11

.—From the above balance	£3,507	14	1
There must be deducted the Premiums undrawn at 30th November, amounting to	191	10	0
Making the probable surplus,	£3,316	4	1

ANTHONY MURRAY, *Convener of Finance Committee.*
W. S. WALKER, *Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

Edinburgh, *5th January* 1876.

ABSTRACT of the ACCOUNTS of the ARGYLL NAVAL FUND for 1874–75.

CHARGE.

1. Funds as at 30th November 1874—						
Loans—						
On Heritable Bond,					£3,000	0 0
On Debenture Bond by Caledonian Railway Co.,					1,000	0 0
					£4,000	0 0
Debenture Stock of the North British Railway Co.,					1,200	0 0
					£5,200	0 0
Balance in Bank at 30th November 1874,					333	7 10
					£5,533	7 10
2 Income received—						
On £3,000 Heritable Bond at 4 per cent., £120 ; less Tax, £1,			£119	0 0		
On £1,200 North British Railway Debenture Stock at 4¼ per cent., £51 ; less Tax, 8s. 6d.			50	11 6		
On £1,000 Debenture Bond by Caledonian Railway Company at 4 per cent., £40 ; less Tax, 6s. 8d,			39	13 4		
			£209	4 10		
On Bank Account for year to 30th November 1875,			3	9 0		
					212	13 10
Sum of Charge,					£5,746	1 8

DISCHARGE.

1. Allowances to the following Five Recipients—						
Everard E. Maxwell, twelfth year,					£40	0 0
George Pirie, ninth year,					40	0 0
Andrew F. Balfour, fourth year,					40	0 0
R. J. A. Montgomerie, third year,					40	0 0
Norman Godfrey Macalister, first year,					40	0 0
2 Funds as at 30th November 1875—						
Loans—						
On Heritable Bond,			£3,000	0 0		
On Debenture Bond by Caledonian Railway Company,			1,000	0 0		
			£4,000	0 0		
Debenture Stock of the North British Railway Company,			1,200	0 0		
			£5,200	0 0		
Balance in Bank at 30th November 1875,			346	1 8		
					5,546	1 8
Sum of Discharge,					£5,746	1 8

ANTHONY MURRAY, *Convener of Finance Committee,*
W. S. WALKER, *Member of Finance Committee.*
KENNETH MACKENZIE, *Auditor.*

Edinburgh, *5th January* 1876.

APPENDIX (B).

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1876.

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GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and established by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are offered for Reports on almost every subject connected with the cultivation of the soil, the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purposes of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising "The COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY ON EDUCATION" to grant Diplomas to Students of Agriculture; and by the establishment of Bursaries.

4. The establishment of Agricultural Stations.

5. The appointment of a Chemist for the purpose of promoting the application of science to agriculture, arranging experiments to be conducted at the Society's Agricultural Stations, and preparing a Report of the same to be published in the Transactions.

6. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise.

7. The appointment of a Board of Examiners, and the granting of First and Second Class Certificates in Forestry.

8. The annual publication of the Transactions, which comprehend the Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a Supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty Ordinary and Ten Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Directors meet on the first Wednesday of each month from November to June. The proceedings of the Directors are reported to General Meetings of the Society, held in January and in June or July.

With reference to motions at General Meetings, Bye-Law No. 7 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Ten Members.

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June or July. The ordinary subscription is L.1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from L.12, 12s. to L.7, 1s. Proprietors farming the whole of their own lands, whose assessment on the valuation Roll does not exceed L.500 per annum, and all Tenant-Farmers, Office-Bearers, of Local Agricultural Associations, Resident Agricultural Factors, Land Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding L.500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying according to the number of previous annual payments, from L.5, 5s. to L.3. According to the Charter, a Member who homologates his Election by paying his first subscription cannot retire until he has paid in annual subscriptions, or otherwise, an amount equivalent to a life composition. Members having Candidates to propose are requested to state whether the Candidate should be on the L.1, 3s. 6d. or 10s. list.

Members of the Society receive the Transactions free on application to the Secretary, and are entitled to apply for District Premiums—to report Ploughing Matches for the Medal—to attend Shows free of charge, and to exhibit Stock at reduced rates.

Orders, payable at the Royal Bank of Scotland, Edinburgh, are issued by the Directors, in name of the parties in whose favour Premiums have been awarded.

All communications must be addressed to "FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 GEORGE IV. BRIDGE, EDINBURGH."

ESTABLISHMENT FOR 1876.

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3.	*Chemical Department,*	C. J. Mackenzie of Portmore.
4.	*Cottages,*	Harry Maxwell Inglis of Loganbank.
5.	*District Shows,*	A. Campbell Swinton of Kimmerghame.
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13.	*Publications,*	Alexander Forbes Irvine of Drum.
14.	*Steam Cultivation,*	The Marquis of Tweeddale, K.T.
15.	*Veterinary Department,*	Captain Tod of Howden.

COMMITTEES FOR 1876.

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,, Wilson, Edinburgh.
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ROBERT HUTCHISON of Carlowrie, Kirkliston.
C. J. MACKENZIE of Portmore, Eddleston.
H. D. ERSKINE of Cardross, Stirling.
THOS. A. HOG of Newliston, Kirkliston.

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9. HALL AND CHAMBERS.

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C. J. Mackenzie of Portmore, Eddleston.
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Thomas D. Findlay of Easterhill, Tollcross, Glasgow.
Bryden Monteith, Tower Mains, Liberton.

12. ORDNANCE SURVEY.

Robert Dundas of Arniston, *Convener.*
C. J. Mackenzie of Portmore, Eddleston.
William S. Walker of Bowland.

13. PUBLICATIONS.

Alexander Forbes Irvine of Drum, *Convener.*
Professor Balfour, Edinburgh.
William S. Walker of Bowland.
Robert P. Newton of Castlandhill, Polmont Bank, Falkirk.
Robert Hutchison of Carlowrie, Kirkliston.

14. STEAM CULTIVATION.

The Marquis of Tweeddale, K.T., *Convener.*
Hon. George Waldegrave Leslie, Leslie House, Leslie.
Sir Thomas Buchan Hepburn of Smeaton, Bart., Prestonkirk.
David Stevenson, C.E., Edinburgh.
Professor Wilson, Edinburgh.
J. W. Hunter of Thurston, Dunbar.
John Gibson, Woolmet, Dalkeith.
Thomas Mylne, Niddrie Mains, Liberton.
P. B. Swinton, Holyn Bank, Gifford.
John Dove, Crosshall, Coldstream.
John Munro, Fairnington, Kelso.

15. VETERINARY DEPARTMENT.

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George Hope of Bordlands, Lauancha.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander M'Dougal, Granton Mains, Edinburgh.
Thomas A. Hog of Newliston, Kirkliston.

SPECIAL COMMITTEES.

1. *Entomological Specimens.*—Robert Scot Skirving, Edinburgh, *Convener;* Professor Wilson; Professor Wyville Thomson; John Wilson, Edington Mains, Chirnside.

2. *Land Improvement.*—The Marquis of Tweeddale, K.T., *Convener;* Charles Smith, Whittingham, Prestonkirk; P. B. Swinton, Holyn Bank, Gifford; Robert Elliot, Laighwood, Dunkeld; Andrew Mitchell, Alloa; Jas. W. Hunter of Thurston, Dunbar.

3. *Transit of Stock.*—Patrick Dudgeon of Cargen, Dumfries, *Convener;* Graham Binny, W.S.; Andrew Gillon of Wallhouse, Bathgate; Alex. Kinloch, yr. of Gilmerton, Drem; R. P. Newton of Castlandhill; John Ord of Muirhouselaw; W. S. Walker of Bowland; Archibald Campbell Swinton of Kimmerghame, Dunse; Alex. F. Irvine of Drum; David Milne Home of Wedderburn.

The President, Vice-Presidents, Treasurer, and Honorary Secretary, are members *ex officio* of all Committees.

AGRICULTURAL EDUCATION.

CERTIFICATES AND DIPLOMA IN AGRICULTURE.

Council on Education.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

Members of Council named by Charter.

The President of the Highland and Agricultural Society—*President.*
The Lord Justice-General—*Vice-President.*

The Lord Advocate.	The Professor of Botany.
The Dean of Faculty.	The Professor of Chemistry.
The Professor of Agriculture.	The Professor of Natural History.
The Professor of Anatomy.	

Members of Council nominated by Society.

The Duke of Buccleuch, K.G.	George Hope of Bordlands.
Sir William Gibson-Craig, Bart.	John Wilson, Edington Mains.
Sir A. C. R. Gibson-Maitland, Bart.	Thomas Mylne, Niddrie Mains.
	James W. Hunter of Thurston.

Board of Examiners.

1. *Science and Practice of Agriculture—Mechanics and Construction.*—Professor Wilson; George Hope of Bordlands; John Wilson, Edington Mains; and Thomas Mylne, Niddrie Mains.
2. *Botany.*—Professor Balfour.
3. *Chemistry.*—
4. *Natural History.*—Professor Wyville Thomson.
5. *Veterinary Surgery.*—Professor Williams.
6. *Field Engineering and Surveying.*—David Stevenson, C.E.
7. *Book-keeping and Accounts.*—Kenneth Mackenzie, C.A.

Standing Acting Committee.

The Lord Justice-General—*Convener.*

The Professor of Agriculture.	George Hope of Bordlands.
The Professor of Botany.	Thomas Mylne, Niddrie Mains.
The Professor of Chemistry.	James W. Hunter of Thurston.

Bye-Laws.

I. That, in terms of the Charter, the Society shall nominate seven members to act on the Council on Education.

II. That the Council shall appoint a Board of Examiners on the following subjects:—Science and Practice of Agriculture; Mechanics and Construction; Botany; Chemistry; Natural History; Veterinary Surgery; Field Engineering and Surveying; and Book-keeping and Accounts.

III. That the examinations shall be both written and oral, that the value of the answers shall be determined by numbers, and that the oral examinations shall be public.

IV. That there shall be three Examinations,* to be styled respectively the "Second Class Certificate Examination," the "First Class Certificate Examination," and the "Diploma Examination." The first to be open to candidates not less than seventeen years of age; the second to those who are not less than eighteen; and the third to those who have completed their twenty-first year.

V. That to pass the "Second Class Certificate Examination," a candidate must be acquainted with the principles and practice of agriculture, agricultural chemistry, surveying and farm engineering, and farm accounts; and that a certificate in the following terms, signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination:—

"We hereby certify that on the A. B. was examined, and has been found to possess a knowledge of agriculture, agricultural chemistry, surveying and farm engineering, and farm accounts."

VI. That to pass the "First Class Certificate Examination" a candidate must be acquainted with the subjects of the second class certificate and any three of the following subjects:—Botany, geology, physics or mechanics, meteorology or climate, natural history, and veterinary practice; and that a certificate in the following terms, signed by the President and Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination:—

"We hereby certify that on the A. B. was examined, and has been found to possess a knowledge of agriculture, agricultural chemistry, surveying and farm engineering, and farm accounts, and that he is therefore entitled to present himself for the further examination, in terms of the regulations, for the Society's Diploma."

VII. That to pass the "Diploma Examination" a candidate must have attained his twenty-first year, and must possess a thorough knowledge of the theory and practice of agriculture, of mechanics and mensuration, of the physiology and treatment of domesticated animals, and of the application of botany, chemistry, and natural history to agriculture; and that a diploma in the following terms, bearing the corporate seal of the Society, and signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination:—

"These are to certify that, on the day of A. B. was examined in the arts and sciences connected with agriculture, and has been reported to be proficient therein by a Board of Examiners nominated by the Council of the Highland and Agricultural Society of Scotland on Education, in terms and by authority of a charter given under the great seal on the 18th day of August 1856."

* It has been resolved that, under ordinary circumstances, the Examinations shall be held annually in the end of March, candidates being required to lodge intimation before the 10th of that month.

VIII. That each successful candidate for the Society's Agricultural Diploma shall thereby become eligible to be elected a free life member of the Society.

IX. That the Society shall grant annually ten bursaries of L.20 each; and five of L.10 each, to be competed for by pupils of schools to be approved of by the Directors, which include or are willing to introduce the teaching of chemistry, and the following branches of natural science—physical geography, botany, and geology, into their curriculum.

X. That the L.20 bursaries shall be tenable for one year at the University of Edinburgh, for the purpose of enabling the holders to take the classes necessary to qualify for the Society's Certificate or Diploma; and the L.10 bursaries to be tenable for the same period to enable the holders to receive another year's preparation at the schools.

XI. That the bursaries shall be determined by examination held in Edinburgh by the Society's Examiners.

XII. That a Standing Acting Committee of the Council on Agricultural Education shall be appointed by the Directors.

* *The following Gentlemen have passed Examinations:—*

For Diploma.

1.	Jacob Wilson, M.R.A.C., Woodhorn Manor, Morpeth,	1858
2.	John Milne, Mains of Laithers, Turriff,	1859
3.	William Henry Eley, Islingham, Frindsbury, Rochester, Kent,	1859
4.	Thomas Rome, M.R.A.C., Northampton Downs, Barcoo River, Queensland,	1859
5.	William Norman, M.R.A.C., Hall Bank, Aspatria,	1860
6.	George Campbell, Shanes Castle, Antrim,	1861
7.	William B. Smith, M.R.A.C., Stoneleigh Villa, Leamington,	1862
8.	*John R. Hetherington*, M.R.A.C., *Carleton, Carlisle*,	1862
9.	William Brown, Factor, Earlsmill, Forres,	1864
10.	Arthur James Hill, M.R.A.C., Accountant, London,	1864
11.	H. R. Goddard, M.R.A.C., Belsay, Newcastle-on-Tyne,	1866
12.	G. Y. Wall, M.R.A.C., Durham,	1866
13.	Robert Brydon, The Dene, Seaham Harbour,	1867
14.	George Kent Walton, Long Campton, Shipston-on-Stour,	1867
15.	Thomas John Elliot, M.R.A.C., Wilton, Salisbury,	1868
16.	John Gerrard, Veterinary Infirmary, Market Deeping,	1869
17.	Colvile Browne, M.R.A.C., Park House, Long Melford, Suffolk,	1872
18.	A. H. Ashdown, M.R.A.C., Uppington, Salop,	1872
19.	Adam Ogilvie Torry, St Anne's, Coupar-Angus,	1872
20.	Italo Giglioli, M.R.A.C., Florence,	1873
21.	Edward Charles Munby, M.R.A.C., Myton Grange, Helperby, Yorkshire,	1873
22.	R. F. Juckes, M.R.A.C., Cotwall, Wellington, Salop,	1873
23.	Forbes Burn, Hardacres, Coldstream,	1874
24.	Henry Erskine, Dalladies, Brechin,	1874
25.	Richard Henderson, Coldstream,	1874
26.	William Kennedy, M.R.A.C., 89 Marine Parade, Brighton,	1875
27.	Thos. Coker Beck, M.R.A.C., Foleshill, Coventry,	1875
28.	George Burn Murdoch, M.R.A.C., Greenhill Lodge, Edin.,	1875
29.	R. W. E. Murray, Wester House Byres, Galashiels,	1875

For 1st Class Certificate.

1.	J. C. Bowstead, M.R.A.C., Halkthorpe Hall, Penrith,	1867
2.	James Taylor, Allan Vale, Pitmuxton,	1868

* Names of those deceased, so far as known, are printed in italics.

3. R. C. Bruce Willis, M.R A.C., 8 Lansdowne Crescent, Cheltenham, ... } 1873
4. John Bramwell, Blackaddie, Sanquhar, . . . 1875
5. George Henry Catt, 44 Middle Street, Brighton, . . 1875
6. Robert Ewing, Reporter, *North British Agriculturist*, Edin., . 1875
7. A. A. Ferguson, Gosfield, Essex, ... 1875
8. John Scott, Howford, Selkirk, ... 1875

For Bursary of L.20.

Alexander Sutherland, Rampyards, Watten, Golspie. Public School, Gersay, ... 1875

SYLLABUS OF EXAMINATION
FOR CERTIFICATES AND DIPLOMA.

I.—SCIENCE AND PRACTICE OF AGRICULTURE, MECHANICS, AND CONSTRUCTION.

1. The principles of rotation. Rotations of cropping in most common use for heavy and for light soils. 2. Manures in ordinary use—usual quantities applied per acre—time and mode of application—their composition and relative values and uses. 3. Composition and classification of soils—their agricultural treatment. 4. The various farm crops—their cultivation, general treatment, and marketable value—ordinary produce per acre, and the different modes of storing them. 5. The breeding, rearing, feeding, and humane treatment of the live stock of the farm—the different breeds—their characteristics—the districts where they are principally met with—and also the best and most humane system of horse-breaking. 6. Drainage operations. 7. The implements used in agriculture, the points to be attended to in their construction and use, and their prices. Text-books—Stephen's "Book of the Farm," published by William Blackwood & Sons; price 50s. Morton's "Cyclopædia of Agriculture," published by Blackie & Son, Glasgow; price 50s. Roscoe's "Lessons in Elementary Chemistry," published by Macmillan & Co., London; price 4s. 6d. Lindley's, Henfrey's (4s. 6d.), or Balfour's (3s. 6d.) "Botany." Page's "Geological Text-Book;" price 7s. 6d.

II.—BOTANY.

1. Nutritive Organs of Plants—root, stem, leaves. Functions of roots. Various kinds of stems, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs—Flower and its parts. Arrangements of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plants or embryo. Sprouting of the seed, or germination. 3. General Principles of Classification—meaning of the terms Class, Order, Genus, Species. Illustrations taken from plants used in agriculture, such as grain-crops, grasses, clovers, vetches, turnips, mangold-wurzel, pease, beans, &c. Practical Examination in fresh Specimens and Models; some of the latter may be seen in the Museum, at the Royal Botanic Garden, which is open daily to the public, free. Text-book—Balfour's "Elements of Botany," published by A. & C. Black, 1876; price 3s. 6d.

III.—CHEMISTRY.

1. Chemistry.

The laws of chemical combination. Atomic theory. Chemistry of the non-metallic elements, and their more important compounds. Potassium,

sodium, calcium, magnesium, iron, and their compounds. Text-book—Roscoe's "Lessons in Elementary Chemistry," published by Macmillan & Co., London; price 4s. 6d.

2. Agricultural Chemistry.

Composition of Plants. Their organic and inorganic constituents. Composition and characters of fertile soils. The principles of manuring. Composition of farm-yard manure. Artificial manures. Their nature and composition. Principles on which they should be used. Feeding stuffs. Their composition and value, and the mode in which they may be most advantageously employed. Text-books—Anderson's "Elements of Agricultural Chemistry," published by A. & C. Black, Edinburgh; price 6s. 6d. Johnson's "How Crops Grow," published by Macmillan & Co., London.

IV. NATURAL HISTORY.

1. Zoology.

1. The Primary Divisions of the Animal Kingdom, with examples of each. 2. The Vertebrate Kingdom. The peculiarities and functions of the alimentary canal, distinguishing the Ruminants. 3. The Orders—Hymenoptera, Diptera, and Coleoptera—with examples of insects injurious to farm crops belonging to each of the Orders—the preservation of birds which prey upon these insects, drawing a distinction between those which are beneficial and those which are destructive to crops.

2. Geology.

4. The various strata forming the earth's crust in their order of deposition. 5. Their influences on the surface soils of the country. 6. The meaning and application of Disintegration, Drift, Alluvium, Dip, Strike, Fault.

V. VETERINARY SURGERY.

1. Anatomy of the digestive organs of horse and ox, describing their structural differences. 2. The process of digestion in the above animals, and food most proper for each in quantity and quality. 3. The management of stock before, at, and after parturition. The time of utero-gestation in the domesticated animals. 4. The general principles to be followed in the treatment of very acute disease, before assistance of the veterinary surgeon can be procured.

VI.—FIELD ENGINEERING AND SURVEYING.

1. Land-Surveying with the Chain. 2. Mensuration of Areas of Land, from a Chain Survey or from a Plan. 3. Levelling with the ordinary Levelling Instrument and Staff. Text-books—Any one of the following:—Butler Williams' "Practical Geodesy," published by J. W. Parker, London; price 8s. 6d.; pages 1 to 20, 24 to 28, 30 to 33, 56 to 59, 118 to 132. "Cassell on Land-Surveying," published by Cassell, Petter, & Galpin, London; or "Bruff on Land-Surveying," published by Simpkin & Marshall, London; the parts which relate to chain-surveying and ordinary levelling only.

VII.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in practice and proportion. 2. Book-keeping—Describe books to be kept; give examples—taking of stock. Text-book—Stephen's "Practical System of Farm Book-keeping," published by Wm. Blackwood & Sons, Edinburgh; price 2s. 6d.

EXAMINATION FOR BURSARIES.

Candidates are examined in the Elements of Chemistry, and of the following branches of Natural Science :—Physical Geography, Botany, and Geology.

It has been resolved that, under ordinary circumstances, the Examinations shall be held annually in the end of October, and Candidates must enter their names with the Secretary before the 10th of that month, and produce the necessary certificates from the teachers of the schools they have attended.

VETERINARY DEPARTMENT.

In the year 1823 the Highland and Agricultural Society instituted lectures in Veterinary Science and Medicine, and arranged with the late Professor Dick to conduct the same.

In 1824 Examinations were commenced and Certificates granted, but only to Students who attended these lectures. Up to the present time 1088 certificates have been issued.

In 1859 the Society resolved that the Students of any Veterinary Teacher in Scotland, established under Her Majesty's sign manual, should be eligible for Examination for the Society's Certificate, and they authorised the Examining Board to take on trial any duly qualified party who made application for the Society's Certificate.

In 1870 the Examinations were opened to the Students of any Veterinary Teacher duly recognised by Government.

In 1872 it was resolved that the Examination should be conducted under the following regulations :—

1. That there be two Examinations yearly, viz.—the First or Preliminary held in July, and the Second or Final in April.

2. Candidates before entering their names for the First or Preliminary Examinations in July, which embrace Botany, Chemistry, and Anatomy, must have attended a Winter and a Summer Session at a Veterinary College recognised by Government, these Sessions being those immediately preceding the examinations, and they must produce certificates from the Professor of each subject.

3. Candidates before entering their names for the Final Examinations in April, which embrace Practical and Clinique, Histology and Physiology, Materia Medica, Cattle Pathology and Horse Pathology, must have attended a Winter Session at a Veterinary College recognised by Government, after passing the First Examination, that Session being the one immediately preceding this examination, and they must produce certificates from the Professor of each subject.

4. Candidates must pass the Practical and Clinical Examination before they can be examined on the other subjects enumerated in No. 3.

5. Candidates failing to pass the Preliminary Examinations in July may present themselves for examination in April previous to going up for the Practical and Clinique.

6. Candidates failing to pass the Final Examination in April, before being allowed to present themselves for Re-examination, are required to attend a Veterinary College during one Session, which must be the one immediately preceding.

7. Members of the Medical Profession, or of any Colonial or Foreign Veterinary School or College, are allowed to present themselves for Examination after attending one Winter Session at a Veterinary College in this country, and receive the Certificate on passing the Final or Major Examination only.

In 1874 the Society resolved to vote Eight Silver Medals (viz., three in July and five in April) to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow, for Class Competition; and two Medium Gold Medals, open to all the Students who come up to the April Examination for the Society's Veterinary Certificate for best general and best practical Clinique Examinations.

The examinations are conducted by leading members of the Medical Faculty and of the Veterinary Profession; and a Certificate in the following terms, bearing the arms of the Society, and signed by the Examiners, is granted to those Students who pass the Final Examinations:—

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Veterinary Examination.

At Edinburgh, the day of 18

These are to certify that has attended as a student during the period prescribed by the regulations established by the Directors of the Society, and, having been examined by us, we consider him duly qualified to practise the Veterinary Art.

Graduates of the Society are eligible for appointment as Veterinary Surgeons in Her Majesty's service, &c.

BOARD OF EXAMINERS—JULY 1875.

1. *Botany.*—Dr Balfour, Edinburgh; Dr Cleghorn, Stravithy, St Andrews.
2. *Chemistry.*—Dr W. Craig, Edinburgh; Mr A. Inglis M'Callum, Edinburgh.
3. *Anatomy.*—Dr Dycer; Mr C. Cunningham, Slateford; Mr Andrew Spreull, Dundee.

BOARD OF EXAMINERS—APRIL 1875.

1. *Practical and Clinical Examinations.*—Mr Thomas A. Dollar, London; Mr Finlay Dun, Weston Park, Shipston-on-Stour; Mr John Steele, Biggar; Mr John Borthwick, Kirkliston; Mr C. Cunningham, Slateford.
2. *Physiology and Histology.*—Dr Dycer, Edinburgh; Mr C. Cunningham, Slateford; Mr Andrew Spreull, Dundee.
3. *Materia Medica.*—Professor Balfour, Edinburgh; Professor Douglas Maclagan, Edinburgh; Mr Finlay Dun, Weston Park, Shipston-on-Stour; Dr Craig, Edinburgh.
4. *Diseases of Horses.*—Mr John Borthwick, Kirkliston; Mr John Lawson, Manchester; Mr A. I. M'Callum, Edinburgh; Mr Wm. Connochie, Selkirk; Mr Tom Taylor, Manchester.
5. *Diseases of Cattle, Sheep, Swine, and Dogs.*—Mr Thomas A. Dollar, London; Mr William Aitken, Kilmarnock; Mr John Steele, Biggar; Mr Alexander Pottie, Paisley.

President of the Board—Dr Dycer, Edinburgh.
President of the Clinical Board—Mr Thomas A. Dollar, London.

SYLLABUS OF VETERINARY EXAMINATIONS.

FIRST EXAMINATIONS HELD ANNUALLY IN JULY.

BOTANY.

Structure and functions of nutritive and reproductive organs of plants. Natural families of medicinal and poisonous Plants. Diseases of agricultural plants caused by fungi. Text-book—Balfour's "Elements of Botany;" A. & C. Black; 3s. 6d.

CHEMISTRY.

Elements of inorganic and organic chemistry; physiological chemistry; testing for commoner metals. *Text-book*—Roscoe's "Lessons in Elementary Chemistry;" Macmillan & Co.; 4s. 6d.

ANATOMY.

Anatomy of bones, muscles, blood-vessels, nerves, and viscera of horse, cow, and dog. Description of relative position of parts displayed by various dissections. Demonstration from actual specimens of muscles, tendons, blood-vessels, and nerves, of horse's limbs, larynx, eye, &c. Comparative anatomy of veterinary patients. The breeding, rearing, feeding, and humane treatment of the live stock of the farm—the different breeds—their characteristics—the districts where they are principally met with—and also the best and most humane system of horse-breaking. *Text-books*—Strangeways' "Anatomy;" Maclachlan & Stewart; 17s. Chauveau's "Comparative Anatomy of the Domesticated Animals," by George Fleming, Veterinary Surgeon, Royal Engineers; Churchill & Sons; L.1, 11s. 6d.

Second Examinations held Annually in April.

THE PRACTICAL AND CLINICAL EXAMINATION

Include diagnosis and treatment, orally and in writing, of cases of lameness and diseases of horses, cattle, sheep, dogs, and swine. Examination of horses as to soundness. Surgical and other operations performed on veterinary patients. Examination, chiefly of morbid specimens, mostly conducted at the abattoirs.

PHYSIOLOGY AND HISTOLOGY.

Minute anatomy of bone, blood, lung, and other tissues, of inflammatory products, and of tumours. Processes of digestion, circulation, respiration, secretion, and excretion. Functions of nervous and reproductive systems. *Text-books*—"Lessons in Elementary Physiology," by Thomas H. Huxley, LL.D. and F.R.S.; Macmillan & Co.; 4s. 6d. Kirkes' "Physiology." Bennet's "Physiology."

MATERIA MEDICA.

Preparation, properties, actions, uses, and doses of medicines. Poisoning in the lower animals, symptoms, post-mortem appearances, antidotes. Writing of prescriptions. *Text-books*—"Veterinary Medicines, their Actions and Uses," by Finlay Dun; Edmonston & Douglas, Edinburgh; 12s. 6d. "Veterinarian's Pocket Conspectus," by Thomas Walley, M.R.C.V.S.; Lorimer and Gillies, Edinburgh.

DISEASES OF HORSES.

Nature, symptoms, post-mortem appearances, causes, treatment, and prevention; accidents; construction and management of stables; shoeing. *Text-books*—"Manual of Veterinary Science," by the late William Dick; A. & C. Black. Green's "Morbid Anatomy." Williams' "Principles and Practice of Veterinary Surgery;" Maclachlan & Stewart, Edinburgh; 30s.

DISEASES OF CATTLE, SHEEP, SWINE, AND DOGS.

Nature, symptoms, post-mortem appearances; remedial and preventive treatment; dieteting and general management of domestic animals. *Text-*

books—Youatt on "Cattle, Sheep, Pigs, and Dogs." Blaine's Principles of Veterinary Art." Gamgee's "Domesticated Animals in Health and Disease;" Fullarton & Co., Edinburgh. Williams' "Principles and Practice of Veterinary Medicine;" 30s.

CERTIFICATES IN FORESTRY.

The Society grants First and Second Class Certificates in Forestry.

Board of Examiners.

1. *Science of Forestry and Practical Management of Woods.*—Dr Cleghorn, Stravithy, St Andrews; John Macgregor, Ladywell, Dunkeld; William M'Corquodale, Scone Palace, Perth; J. Grant Thomson, Grantown, Strathspey.
2. *Elements of Botany.*—Professor Balfour, Edinburgh.
3. *Nature and Properties of Soils, Drainage, and Effects of Climate.*—Professor Wilson, Edinburgh.
4. *Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-Making: Implements of Forestry.*—A. W. Belfrage, C.E., Edinburgh.
5. *Book-keeping and Accounts.*—Kenneth Mackenzie, C.A., Edinburgh.

Candidates must possess—1*st*, A thorough acquaintance with the details of practical forestry. 2*d*, a general knowledge of the following branches of study, so far as these apply to Forestry:—The Outlines of Botany; the Nature and Properties of Soils, Drainage and Effects of Climate; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts. The Examinations are open to Candidates of any age.

The following have passed for First-Class Certificate:—

1.	*C. F. Bligh, England,**	1870
2.	George Young Wall, M.R.A.C., Durham, . .	1870
3.	William Baillie, Forester, Whitingham, East Lothian, .	1871
4.	William Robertson, Forester's House, Lauder. . .	1871
5.	Peter Loney, Marchmont, Dunse, ...	1873

SYLLABUS OF EXAMINATION.

I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

1. Formation and ripening of Wood. Predisposing causes of decay. 2. Restoration of Wood-lands:—(1.) Natural reproduction; (2.) Artificial planting. 3. General management of plantations. Cropping by rotation. Trees recommended for different situations. 4. Season and methods of pruning, thinning, and felling. 5. Circumstances unfavourable to the growth of trees. 6. Mechanical appliances for conveying and converting timber. Construction of saw-mills. 7. Qualities and uses of chief indigenous timbers. Processes of preserving timber. 8. Management of nurseries. Seed-sowing. 9. Collection of forest produce. 10. Manufacture of tar and charcoal. 11. Insects

* Names of those deceased, so far as known, are printed in italics.

injurious to trees—preservation of birds which prey upon them, drawing a distinction between birds which are beneficial and those which are destructive to trees.

II.—ELEMENTS OF BOTANY.

1. Nutritive Organs of plants.—Root, stem, leaves. Functions of roots. Various kinds of stems, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs.—Flower and its parts. Arrangement of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed or germination. 3. General Principles of Classification.—Meaning of the terms Class, Order, Genus, Species. Illustrations taken from common forest trees and shrubs. Practical Examination on fresh specimens and models; some of the latter may be seen in the Museum at the Royal Botanic Garden, which is open daily to the public free. Candidates may consult Professor Balfour's "Elements of Botany," published by A. & C. Black, Edinburgh, 1869. Price 3s. 6d.

III.—NATURE AND PROPERTIES OF SOILS, DRAINAGE AND EFFECTS OF CLIMATE.

1. The different descriptions of soils, their classification, and suitability to growth of different descriptions of timber trees. 2. The composition and constituents of soils. The relations between the soil and trees growing on it. 3. The effects of drainage on soils and on climate. 4. The mode of drainage for plantations. 5. The influence of temperature, rainfall, aspect, shelter, and prevailing winds on tree life. 6. The methods of registering and recording observations, and the instruments used.

IV.—LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, BRIDGING, AND ROAD-MAKING; IMPLEMENTS OF FORESTRY.

1. The use of the Level and Measuring Chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, faggots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances. 6. The different implements and tools used in planting, pruning, felling, barking, and working up timber trees, or prepairing them for sale. Ewart's "Agricultural Assistant;" Blackie & Son, Glasgow and Edinburgh; price 3s. 6d. Strachan's "Agricultural Tables;" Oliver & Boyd, Edinburgh; price 2s. 6d.

V.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in practice and proportion. 2. Book-keeping—describe books to be kept; give examples. Taking of stock.

CHEMICAL DEPARTMENT.

Chemist.—

The object of the Chemical Department are to arrange Experiments to be conducted at the Society's Agricultural Stations, &c.

(*This department is under reconsideration.*)

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

All Reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter—initials must not be used.

No sealed letter, unless belonging to a Report found entitled to at least one-half of the Premium offered, will be opened without the author's consent.

Reports, for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors, if applied for within twelve months.

When a Report is unsatisfactory, the Society is not bound to award the whole or any part of a Premium.

All Reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the imperial standards.

The Directors, before awarding a Premium, shall have power to require the writer of any Report to verify the statements made in it.

The decisions of the Board of Directors are final and conclusive as to all Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

Reports on subjects not included in the Premium List will be received, and honorary rewards will be given when merited.

CLASS I.

REPORTS.

Section 1.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

For Approved Reports.

1. On the Agriculture of the Counties of Edinburgh and Linlithgow, and the industrial progress and development of these Counties during recent years—Thirty Sovereigns. To be lodged by 1st November 1876.

The Report should embrace full details of the different systems of Farm Management observed in the Counties, and of the progress which Agriculture and other industries have made within the last 25 years.

2. On the Agriculture of the Counties of Ross and Cromarty —Thirty Sovereigns. To be lodged by 1st November 1876.

The Report should embrace full details of the different systems of Farm Management observed in the Counties, and of the progress which Agriculture has made within the last 25 years.

3. On the Agriculture of the County of Argyll—Thirty Sovereigns. To be lodged by 1st November 1877.

The Report should embrace full details of the different systems of Farm Management observed in the County, and of the progress which Agriculture and other industries have made within the last 25 years.

4. On the Physiological Distinctions in the Condition of the Scottish Peasantry in different Districts—Thirty Sovereigns. To be lodged by 1st November 1876.

The Reporter must furnish statistics of the longevity, &c., of the peasantry, as contrasted with other classes, and give suggestions for the amelioration of any causes which affect them injuriously.

5. On Agricultural Experimental Stations—Twenty Sovereigns. To be lodged by 1st November 1876.

Reporters must state the conditions necessary to secure trust-worthy results in conducting Agricultural Experimental Stations in Scotland.

6. On the comparative advantages in Scotland of Ploughing in Manure in Autumn or Winter immediately after it is spread on the land, or of allowing it to remain on the ground for some weeks before it is covered—The Medium Gold Medium, or Five Sovereigns. To be lodged by 1st November 1876.

7. On the results of Experiments for ascertaining the comparative value of farm-yard Manure obtained from cattle fed upon different varieties of food, by the application of such manures to farm crops—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

8. On the comparative value of Manure made in the ordinary manner, and of Manure kept under cover till applied to the Land—Twenty Sovereigns. To be lodged by 1st November in any year.

The experiment may be conducted either with manure made in the open straw-yard, contrasted with that made in covered hammels or boxes, or with manure made in feeding houses, part of which shall have been placed under cover, and part removed to the open dung-pit, and kept carefully unmixed with any other manure. Preference will be given to experiments embracing both of these modes. The cattle must be fed and littered alike. There must be at least an acre of land experimented on with each sort of manure—the different lots must be manured to the same extent, and be equal in soil, and the crops must be accurately weighed and measured on two separate portions of each lot, not less than 20 poles. The result, as given by two successive crops, to be reported.

9. On the means successfully employed for obtaining new Agricultural Plants, or new and superior varieties, or improved sub-varieties, of any of the cereal grains, grasses, roots, or other agricultural plants at present cultivated in this country—Medals or Sums of Money not exceeding Fifty Sovereigns. To be lodged by 1st November in any year.

It is necessary that the varieties and sub-varieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well-known sorts, should be stated. The reporter is further requested to mention the effects that he may

have observed produced by different soils, manures, &c., on the plants forming the subjects of report, and how far he may have ascertained such effects to be lasting.

Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving expense and long-continued attention, a higher premium will be awarded.

10. On the cultivation of the Cabbage as a field crop—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1876.

The experiment must be conducted in Scotland on not less than one acre, and contrasted with a like extent under turnips in the same field. Both lots must have been under one rotation, and must be prepared and manured in the same manner.

11. On the hardy and useful Herbaceous Plants of any country where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Attention is particularly directed to the Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya country, the Falkland and South Sea Islands, California, and the high north-western district of America.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, or other products.

12. On the comparative advantages of fattening Cattle in stals, in loose houses or boxes, and in sheds or hammels—Twnty Sovereigns. To be lodged by 1st November in any yeai

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food must be used. Information is required as to the comparative expense of attendance, the cost of recting the buildings, and any other circumstance deserving of attention. The state of the weather during the experiment, in point of tmperature and wetness, must be particularly noted and reported.*

13. On experiments for ascertaining the actual addition of weight o growing or fattening Stock, by the use of different kinds o food—Twenty Sovereigns. To be lodged by 1st Novembe in any year.

The atention of the experimenter is directed to turnips, carrots, beet, mangold wurzel, potatoes, cabbage, as well as to beans, oats, barley, India corn, linseed, oil-cake or rape-cake, and to the effect of warmth

and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substance in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for reports of which encouragement will be given.*

* The experiments specified in Nos. 12 and 13 must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

14. On the Polled Angus or Aberdeen Breed of Cattle, and the means that have been or might be used for its improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1876.

15. On the breeding of Horses for the road or field, and their treatment when young—Ten Sovereigns. To be lodged by 1st November 1876.

This Report is confined to breeders of horses, who are requested to state their own experiments and results.

16. On the adaptability of the various soils to the breeding and rearing of Horses—Ten Sovereigns. To be lodged by 1st November 1876.

The Report must state the diseases arising from pasturing on the various soils, and how to prevent them.

17. On the effect of Sewage upon the Animal System, introduced either with drinking water or with herbage when it has been used as a top-dressing—Ten Sovereigns. To be lodged by 1st November 1876.

18. On the comparative Return from Capital invested in Cropping, Grazing, or Planting land upon hill and moorland—Twenty Sovereigns. To be lodged by 1st November 1876.

The subject to have reference not only to immediate return upon capital expended, but also to be considered in relation to the amelioration of the soil, climate, and prospective enhancement of value thereby.

19. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year,

The purpose chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

Section 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By a Proprietor or Tenant in Scotland on the cultivation of not less than 150 imperial acres of land of inferior quality—First Premium, L.200; Second, L.150. Intimation of intention to compete to be lodged by 1st November 1876.

The operations to be reported on must be commenced not later than the autumn of 1876—be conducted on a farm of at least 150 acres imperial—extend over a period of not less than 5 or 6 years—and embrace a complete rotation of crops.

The Society will appoint a Committee, who shall determine if the land is of the class referred to. The Committee shall periodically inspect the operations, and shall have power to call for information on any point they may consider necessary. They shall not in any way interfere with the system of management pursued, nor make any suggestions, but shall take their own notes, so as to be able to check the statements made in the report.

The Report must detail the previous state of the land and the system of cultivation pursued thereon, if any—the nature of the soil and sub-soil—the whole operations carried on, including trenching, draining, liming, fencing, road-making, &c., during the rotation, and the cost thereof—the quantity and cost of all seed and manure applied—the produce of each crop—and the kind and quantity of live stock kept. Classified abstracts of the whole expenditure and return for each year must also be given.

2. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Medium Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the reporter's proprietorship.

3. By the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings—The Gold Medal. Reports, Plans, and Specifications to be lodged by 1st November in any year.

4. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of waste land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

5. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of waste land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

6. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 4, 5, and 6 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of a profitable character, and a rotation of crops must have been concluded before the date of the report. *A detailed statement of the expenditure and return*, and a certified measurement of the ground, are requisite.

7. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

8. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 7 and 8 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Section 3.—MACHINERY.

FOR APPROVED REPORTS.

1. On such inventions or improvements, by the reporters, of any implement or machine as shall be deemed by the Society of public utility—Medals, or sums of money not exceeding Fifty Sovereigns. To be lodged at any time.

Reports should be accompanied by drawings and descriptions of the implement or machine, and, if necessary, by a model.

2. On a machine for cutting or condensing Turf or Peat by steam or horse power—Twenty Sovereigns. To be lodged by 1st November 1876.

3. On the best and most approved Cattle Truck for feeding and watering the animals in transit—Twenty Sovereigns. To be lodged by 1st November 1876.

Reports must be accompanied with drawings and descriptions, or, if necessary, by a model.

Section 4.—FORESTRY DEPARTMENT.

FOR APPROVED REPORTS.

1. By a Proprietor in Scotland who shall, within the five preceding years, have planted not less than 150 acres—The Gold Medal. To be lodged by 1st November in any year.

The whole planting operations which may have been conducted by the reporter within the five years, whether completed or not, must be embraced, and he must state the expense—description of soils,—age, kind, and number of trees planted per acre—mode of planting, draining, and fencing—general state of the plantation—and any other observations of interest.

2. By a Practical Forester, on the management of Plantations from the commencement of the first thinning till the period of yielding full-grown timber—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

The Report must embrace the following points:—The progress of the different sorts of trees—the effects of altitude and exposure—the general advantages of shelter—the mode of thinning and pruning adopted—the uses and value of the thinnings—the plan of registry and of valuing, or a specimen of the method in which the forester's book is kept—the valuation of the time of the report—together with such general remarks as may be thought useful.

The Report is not expected to embrace the formation and early management, farther than the description of soil, kinds of plants, whether

mixed or in masses, together with a note of the expense from the time of planting to the commencement of the first thinning, in so far as such information is in the possession of the reporter.

3. On Plantations, of not less than eight years' standing, formed on deep peat bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1876.

The Premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

4. On the more extended introduction of hardy, useful, or ornamental Trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress should be mentioned. Attention is directed to the introdution of any tree as a nurse in young plantations, which by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantages and avoid the evils of thick planting.

5. On the management of the Picea Nordmanniana (*Taxodium sempervirum*) or Red Wood for timber purposes—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1876.

The Report must also state the uses so far as has been tried, and the soils and situations best adapted for it.

6. On the Cutting and Transport of Firewood (soft and hard wood) with detailed statement of charges—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1876.

In many districts large branches and tops of trees are burned up, which in England, and much more on the Continent, are sold at a profit. The Report should state the system pursued, and contain practical suggestions for utilising fragments now destroyed.

7. On the more extended cultivation in Scotland of charcoal-producing Plants, for gunpowder or commercial purposes—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1876.

Reference to be made to suitable varieties of plants not generally grown

in this country for that purpose, such as *Rhamnus Frangula*, prices realisable, and suggestions for their more general introduction, treatment, &c.

8. On the woods, forests, and forestry in the county of Perth —The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1876.

9. On the woods, forests, and forestry in the county of Ross —The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1876.

10. On the utilisation of waste produce of Forests and Wood-lands as matter for making, either separately or in combination with other substances, an artificial fuel—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1876.

CLASS II.

DISTRICT COMPETITIONS.

The Money Premiums and Medals awarded at District Competitions will be issued in January next. No Payments must, therefore, be made by the Secretary or Treasurer of any local Association.

Grants in Aid of DISTRICT COMPETITIONS *for* 1877 *must be applied for before* 1*st* NOVEMBER *next.*

When a Grant has expired, the District cannot apply again for aid for two years.

SECTION 1.—CATTLE.

Note.—The Society's Cattle Premiums are granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee, to be awarded for the best Bull belonging to a Proprietor, and of the class for which the District receives Premiums; also three Medium Silver Medals to be given along with the first prize in the three Classes of Cattle, provided there are not fewer than two lots exhibited in each class.

The selection of the Breed is left to the local Committee. See Rule 6.

DISTRICTS.

1. COUNTY OF STIRLING.—*Convener*, Sir Alexander C. R. Gibson Maitland of Clifton Hall, Bart.; *Secretary*, Robert Taylor, 49 King Street, Stirling.
2. DISTRICTS OF LORN AND NETHER LORN.—*Convener*, James Bett, Easdale; *Secretary*, Angus Whyte, Easdale, Oban.
3. DISTRICT OF ARGYLL.—*Convener*, Captain Orde, yr. of Kilmory, Auchnaba, Lochgilphead; *Secretary*, William Hopewell, Raslie Cottage, Kilmartin.
4. DISTRICT OF UPPER STRATHEARN.—*Convener*, D. R. Williamson of Lawers, Crieff; *Secretary*. James M'Laren, Crieff.
5. COUNTY OF ELGIN.—*Convener*, Robert Grant of Kincorth, Forres; *Joint-Secretaries*, William Macdonald, Elgin, and John Ferguson, East Grange, Forres.
6. COUNTY OF RENFREW.—*Convener*, Colonel Campbell of Blythswood; *Secretary*, R. L. Henderson, Paisley.
7. DISTRICT OF EAST KILBRIDE.—*Convener*, William Forrest of Lawmuir, Allanton, Hamilton; *Secretary*, William Hay, East Kilbride.

8. District of Strathbogie.—*Convener*, Robert Simpson of Cobairdy, Huntly; *Secretary*, Alexander F. Leslie, Corskellie, Huntly.
9. District of the United Banffshire Society.—*Convener*, W. J. Tayler of Glenbarry, Rothiemay House, Huntly; *Secretary*, George Cumming, Banff.
10. County of Kincardine.—*Convener*, Sir Thomas Gladstone of Fasque, Bart., Laurencekirk; *Secretary*, James B. Greig, Laurencekirk.
11. District of Garioch.—*Convener*, William Leslie of Warthill, Pitcaple; *Secretary*, William Home, Westerton of Pitmedden, Insch.

PREMIUMS.

1. Best Bull, of any pure breed, belonging to a Proprietor, The Silver Medal.
2. Best Bull, of any pure breed, calved before 1st January 1874,
   Medium Silver Medal and L.4
   Second best, ... L.3
   Third best, ... L.1
3. Best Bull, of any pure breed, calved after 1st January 1874,
   Medium Silver Medal and L.3
   Second best, ... L.2
   Third best, ... L.1
4. Best 2-year-old Heifer (if Highland breed, 3 years), of any pure breed,
   Medium Silver Medal and L.3
   Second best, ... L.2
   Third best, ... L.1

In 1876.

Nos. 1, 2, and 3 are in competition for the last year.
No. 4, for the first year.
Nos. 5, 6, and 7 compete for local Premiums.
Nos. 8, 9, 10, and 11 are in abeyance on account of the Aberdeen Show.

Section 2.—HORSES

FOR AGRICULTURAL PURPOSES.

Note.—The Society's Stallion Premiums are granted to each District for two years, and are followed by Premiums for other two years for Brood Mares, and again for a similar period by Premiums for Entire Colts and Fillies.

1. Stallions.

1. District of Easter Ross.—*Convener*, Kenneth Murray of Geanies, Fearn; *Secretary*, John Douglas, Calrossie, Nigg, Ross-shire.
2. District of the Royal Northern Society.—*Convener*, Colonel Innes of Learney, Torphins; *Secretary*, Alexander Yeats, Secretary, Royal Northern Society, Aberdeen.
3. District of the Dalbeattie Society.—*Convener*, W. H. Maxwell of Munches, Dalbeattie; *Secretary*, James Grieve, Dalbeattie.
4. Rhins District of Wigtownshire.—*Convener*, R. Vans Agnew of Barnbarroch, M.P.; *Secretary*, Hugh Adair, Stranraer.
5. District of Auchtermuchty.—*Convener*, John Bogie, Balcanquhal, Auchtermuchty; *Secretary*, H. W. Walker, Auchtermuchty.
6. District of the East of Fife Society.—*Convener*, John Anstruther Thomson of Charlton, Colinsburgh; *Secretary*, John Flockhart, Colinsburgh.

Best Stallion, not under 3 years, and not above 12 years old, . . L.25

In 1876.

Nos. 1 and 2 are in competition for the last year.
Nos. 3, 4, 5, and 6 for the first year.

2. Mares.

1. District of Selkirk and Galashiels.—*Convener*, Allan Eliott Lockhart of Borthwickbrae, Hawick; *Secretary*, James Smail, Commercial Bank, Galashiels.
2. County of Caithness.—*Convener*, Alexander Henderson of Stemster, Halkirk Road, Golspie; *Joint-Secretaries*, James Brims, Writer, Thurso; and James Purves, Lochend, Dunnet.
3. Western District of Fifeshire.—*Convener*, Robert Husband, Gellet, Dunfermline; *Secretary*, James M'Farlane, Dunfermline.
4. District of Strathendrick.—*Convener*, C. H. H. Wilsone of Dalnair, Endrick Bank, Drymen; *Secretary*, James Murray, Catter House, Drymen.

1. Best Brood Mare, ... Medium Silver Medal and L.4
2. Second best, ... L.3
3. Third best, ... L.1

In 1876.

Nos. 1 and 2 are in competition for the last year.
Nos. 3 and 4 for the first year.

3. Entire Colts and Fillies.

1. County of Inverness.—*Convener*, Æneas W. Mackintosh of Raigmore, Inverness; *Secretary*, Hugh Fraser, Balloch of Culloden, Inverness.
2. Island of Skye.—*Convener*, ; *Secretary*, Alexander Macdonald, Portree.
3. District of the Black Isle.—*Convener*, James Fletcher of Rosehaugh, Avoch; *Secretary*, James R. Mitchell, Drynie, Inverness.
4. County of Kinross.—*Convener*, Harry Young of Cleish Castle, Kinross; *Secretary*, James Beveridge of Balado, Kinross.
5. District of Buchan.—*Convener*, Lieutenant-Colonel Ferguson of Pitfour, Mintlaw; *Secretary*, John Ferguson, Brae of Coynach, Mintlaw.

1. Best Entire Colt, foaled after 1st January 1874, Medium Silver Medal and L.3
   Second best, ... L.2
   Third best, ... L.1
2. Best Entire Colt, foaled after 1st January 1875, Medium Silver Medal and L.2
   Second best, ... L.1
   Third best, ... 10s.
3. Best Filly, foaled after 1st January 1874, Medium Silver Medal and L.3
   Second best, ... L.2
   Third bsst, ... L.1
4. Best Filly, foaled after 1st January 1875, Medium Silver Medal and L.2
   Second best, ... L.1
   Third best, ... 10s.

In 1876.

Nos. 1 and 2 are in competition for the last year.
Nos. 3 and 4 for the first year.
No. 5 is in abeyance on account of the Aberdeen Show.

Section 3.—SHEEP.

Note.—The Society's Sheep Premiums are granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee, to be awarded for the best Tup belonging to a proprietor, and of the class for which the District receives Premiums; also four Medium Silver Medals, to be given along with the first prize in the four classes of Sheep, provided there are not less than two lots in each class.

The selection of the Breed is left to the Local Committee. See Rule 6.

DISTRICTS.

1. West Lothian and the Eastern District of Stirlingshire.—*Convener*, Sir William Baillie of Polkemmet, Bart., Whitburn; *Secretary*, George Wilson, Loch House, Linlithgow.
2. District of Cowal.—*Convener*, Alex. S. Finlay of Castle Toward, Greenock; *Secretary*, Archibald Mitchell, jun., Dunoon.
3. County of Forfar.—*Convener*, The Earl of Strathmore, Glamis Castle, Glamis; *Secretary*, J. L. Gordon, Swan Street, Brechin.
4. District of West Teviotdale.—*Convener*, W. Scott Watson of Burnhead, Bucklands, Hawick; *Secretary*, James Oliver of Thornwood, Hawick.
5. District of Breadalbane.—*Convener*, The Earl of Breadalbane, Taymouth Castle, Aberfeldy; *Secretary*, John Holmes, Bolfracks, Aberfeldy.
6. Island of Arran.—*Convener*, James Paterson, Whitehouse, Lamlash; *Secretary*, William Tod, Glenree, Lamlash.
7. District of the Badenoch and Rothiemurchus Society.—*Convener*, Cluny Macpherson, Cluny Castle, Kingussie; *Secretary*, Donald Stewart, Chapelpark, Kingussie.
8. County of Sutherland.—*Convener*, George Loch of Embo, Q.C.; *Secretary*, William Mitchell, Pulrossie, Dornoch.
9. District of the West Linton Society.—*Convener*, A. P. Hope, yr. of Bordlands, Lamancha; *Secretary*, A. Alexander, West Linton.
10. Upper Ward of Lanarkshire.—*Convener*, John Ord Mackenzie of Dolphinton; *Secretary*, David Oswald, Abington.
11. Islands of Mull, Coll, and Tyree.—*Convener*, Farquhar Campbell of Rum; *Secretary*, David Thorburn, Calgary, Tobermory.

1. Best Tup belonging to a Proprietor,	The Silver Medal.
2. Best Tup above one Shear,	Medium Silver Medal and L.3
Second best,	L.1
Third best,	10s.
3. Best Shearling Tup,	Medium Silver Medal and L.3
Second best,	L.1
Third best,	10s.
4. Best 5 Ewes, above one Shear,	Medium Silver Medal and L.3
Second best,	L.1
Third best,	10s.
5. Best 5 Gimmers or Shearling Ewes,	Medium Silver Medal and L.3
Second best,	L.1
Third best,	10s.

In 1876.

Nos. 1, 2, and 3 are in competition for the last year.
Nos. 4 and 5 for the second year.
No. 6 for the first year.
Nos. 7, 8, 9, 10, and 11 compete for local Premiums.

Section 4.—SWINE.

The Society's Swine Premiums are given for three consecutive years.

1. Best Boar belonging to a Proprietor, . . . The Silver Medal.
2. Best Boar, ... Medium Silver Medal and L.3
   Second best, ... L.1
   Third best, ... 10s.
3. Best Brood Sow, ... Medium Silver Medal and L.2
   Second best, ... L.1
   Third best, ... 10s.

In 1876.

No application has been received.

Section 5.—DAIRY PRODUCE.

The Society's Dairy Premiums are given for three consecutive years.

1. Best Couple of Sweet Milk Cheeses belonging to a Proprietor, ... The Silver Medal.
2. Best Couple of Sweet Milk Cheeses, . Medium Silver Medal and L.2
   Second best, ... L.1
   Third best, ... 10s.
3. Best Cured Butter (not less than 14 lbs.) belonging to a Proprietor, ... The Silver Medal.
4. Best Cured Butter (not less than 14 lbs.). Medium Silver Medal and L.2
   Second best, ... L.1
   Third best, ... 10s.

In 1876.

No application has been received.

RULES OF COMPETITION.

1. The Members of the Society connected with the respective Districts are appointed Committees for arranging the Competitions; five members to be a quorum.

2. The Convener of each District shall summon a meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges, and other preliminary arrangements. The time and place (which must be within the bounds of the District, unless in reference to Stallions special permission has been obtained to the contrary), shall be publicly intimated by Conveners.

3. The Money Premiums awarded at District Competitions will be paid in January next, by precepts issued by the Directors. No payments must, therefore, be made by the Secretary or Treasurer of any local Association.

4. Stock must be the property of the Exhibitor at the date of Entry. *No entry shall be received later than one week previous to the Show.* Entry-Money shall not exceed 2½ per cent. on the amount of the premium to be competed for.

5. The Competitions (except for Horses) must take place between the 1st of April and the 20th of October, and are open to all parties within the District, whether members of the local Association or not.

6. The Committee shall select the breed, and specify it in the returns. In Cattle, the animals exhibited must belong to one of the following pure breeds —Short-horn, Ayrshire, Polled (Galloway, Angus, or Aberdeen), Highland. The Bulls may be of one breed, and the Heifers of another. In Sheep, the breeds must be Leicester, Cheviot, or Blackfaced.

7. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition.

8. An animal which has gained the Society's first Premium at a previous District or General Show is inadmissible in the same Class, except in the case of Clydesdale Stallions, Bulls, and Tups for the Medal; and one which has gained a second Money Premium can only thereafter compete in that Class for the first.

9. The Premiums shall not be divided. In Cattle, Horses, Sheep, and Swine, four lots in each Class will warrant the award of full, and two lots of half, Premiums. In Dairy Produce, eight Exhibitors in any one Class will warrant an award of full, and four of half, Premiums. A competitor may exhibit two lots in each Class, except in Dairy Produce, where only one lot is allowed from the same farm. For the Silver Medal to Proprietors two lots are required. To authorise the award of the Medals in the intermediate year, there must not be less than two lots in each Class.

10. The Premiums for Stallions are open to General Competition. The other Money Premiums are restricted to Tenant Farmers and Proprietors farming the whole of their own lands, and not also Owners of land to an extent exceeding L.500 per annum.

11. A Tenant or Factor may compete with Proprietors for the Silver Medal with a Bull or a Tup which has gained the first Money Premium at a previous District or General Show. When there is any doubt as to whether a competitor should be ranked as a Proprietor or a Tenant, the point is left to the decision of the local Committee.

12. A Bull the property of two or more Tenants, may compete, although the Exhibitors may not be Joint-Tenants.

13. Bulls for which Money Premiums are awarded may be required to serve in the District at least one season; the rate of service to be fixed by the Committee.

14. Evidence must be produced that the Prize Stallions have had produce.

15. Mares must have foals at foot (except when death of foal is certified), or be entered as being in foal; in the latter case, payment of the Premiums will be deferred till certificate of birth, which must be within 11 months from the date of the Show.

16. Aged Tups shall have served for at least three weeks during the previous season. All Prize Tups must serve within the district. Ewes and Gimmers must be taken from the Exhibitor's stock, and must have been bred by him in the district; and Ewes must have reared Lambs during the season. Fleeces must not be artificially coloured.

17. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualifications or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor may be disqualified from again competing for the Society's Premiums, and his name, if he be a member, struck from the roll.

18. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state

it and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

19. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their Dairies in 1876, and that the quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

20. It is to be distinctly understood that in no instance does any claim lie against the Society for expenses attending a show of stock beyond the amount of the Premiums offered.

21. Blank reports will be furnished to the Conveners and Secretaries of the different districts. These must, in all details, be completed, and lodged with the Secretary *on or before the 1st of November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

22. A report of the Competitions and Premiums awarded at the *intermediate* local shows in the several districts for Cattle and Sheep, signed by a member of the Society, must be transmitted to the Secretary *on or before the 1st of November in each year*, otherwise the Society's grants shall terminate.

23. When a grant has expired the district cannot apply again for aid for two years.

Section 6.—SPECIAL GRANTS.

L.50 and Medium Gold Medal to the Edinburgh Christmas Club for 1876.

L.50 to the Glasgow Agricultural Society for 1876, for Thorough-bred Stallion.

L.20 to the Ayrshire Agricultural Association for 1876, to be competed for at the Dairy Produce Show at Kilmarnock—*Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary*, James M'Murtrie, Ayr.

L.10 to Unst Society for three consecutive years—*Convener*, D. C. Edmondston, Ordale, Balta Sound, Unst; *Secretary*, D. J. White, Unst, Lerwick. Granted 1876.

L.3 to Rousay Society for three alternate years—*Convener*, Colonel F. W. Traill Borroughs of Rousay, C.B., Orkney; *Secretary*, John Gibson, Sangskail, Rousay. Granted 1875.

L.3 to Westray Society for three alternate years—*Convener*, ; *Secretary*, James Walker, Brough, Westray, Kirkwall. Granted 1876.

Section 7.—MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Medium Silver Medals annually to Societies not on the list of Cattle or Sheep Premiums, in addition to the Money Premiums awarded in the District, for—

1. Best Bull, Cow, Heifer, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Coops of Poultry.
6. Best sample of any variety of Wool.
7. Best sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.

11. Best managed Dairy.
12. Best Sweet Milk Cheese.
13. Best Cured Butter.
14. Best Collection of Roots.
15. Best kept Fences.
16. Male Farm-Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.
17. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
18. Best Sheep Shearer.
19. Most expert Hedge Cutter.
20. Most expert Labourer at Draining.
21. Most expert Farm Servant at trial of Reaping Machines.
22. Best Maker of Oat Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are given for Five consecutive years.

Aberdeenshire.

1. Auchindoir, Kildrummy, and Towie Association.—*Convener*, Carlos Pedro Gordon of Wardhouse, Insch; *Secretary*, William Walker, Ardhuncart, Mossat. 4 Medals. Granted 1873.

2. Cromar, Upper Dee and Donside Association.—*Convener*, Dr Robertson, Indego, Tarland; *Secretary*, William Thomson, Banker, Tarland. 4 Medals. Granted 1872 and 1873.

3. Ebrieside Association.—*Convener*, John Leith Ross of Arnage, Ellon; *Secretary*, George Johnston, Overton, Auchnagatt. 2 Medals. Granted 1874.

4. Fyvie Association.—*Convener*, Col. Gordon of Fyvie; *Secretary*, James Ironside, Burnside, Fyvie. 2 Medals. Granted 1872.

5. Insch Horticultural Society.—*Convener*, Col. Leith Hay of Rannes, C.B., Leith Hall, Kinnethmont; *Secretary*, John Gartly, Insch. 2 Medals. Granted 1874.

6. Keig Poultry and Dairy Produce Association.—*Convener*, Lord Forbes, Castle Forbes, Keig, Aberdeen; *Secretary*, George Bruce, Wealthiton, Keig, Witehouse, Aberdeen. 2 Medals. Granted 1872.

7. Kincardine O'Neil and Upper Deeside Association.—*Convener*, Col. Innes of Learney, Torphins; *Secretary*, Alexander Niven, Craigmyle Mills, Torphins. 3 Medals. Granted 1873.

8. Kinnethmont Society.—*Convener*, Col. Leith Hay of Rannes, C.B., Leith Hall, Kinnethmont; *Secretary*, William Gerrard, Schoolhouse, Kinnethmont. 3 Medals. Granted 1874.

9. Mar Association.—*Convener*, Wm. Wishart, Cairntradlin, Blackburn, Aberdeen; *Secretary*, Silvester Campbell, Kinnellar, Blackburn, Aberdeen; 4 Medals. Granted 1874.

10. North-East Aberdeenshire Society.—*Convener*, Alex. Lovie, Nether Boyndlie, Fraserburgh; *Secretary*, John Bell, Merryhillock, Fraserburgh. 6 Medals. Granted 1873.

11. North of Scotland Root, Vegetable, and Fruit Association.—*Convener*, Lieut-Col. Ramsay of Barra, Straloch, Aberdeen; *Secretary*, James Smith, High Street, Inverurie. 2 Medals. Granted 1874.

12. Strichen Society.—*Convener*, Alex. Whitelaw, M.P. ; *Secretary*, John Sleigh, Strichen. 1 Medal. Granted 1873.

13. Vale of Alford Turnip Association.—*Convener*, R. O. Farquharson of Haughton, Alford, N.B.; *Secretary*, J. Reid, Bents, Alford. 2 Medals. Granted 1875.

14. Warthill Turnip Club.—*Convener*, William Leslie of Warthill, Pitcaple ; *Secretary*, Adam Singer, Rothmaise, Insch. 2 Medals. Granted 1873.

Argyllshire.

15. Kintyre Society.—*Convener*, John Lorn Stewart of Coll, Campbeltown; *Secretary*, J. L. Pearson, Campbeltown. 4 Medals. Granted 1873.

16. Lochbuy Society.—*Convener*, M. G. Maclaine of Lochbuy, Oban ; *Secretary*, Donald M'Phail, Cameron Farm, Mull, Oban. 2 Medals. Granted 1876.

Ayrshire.

17. Carrick Society. — *Convener*, James Baird of Cambusdoon, Ayr; *Secretary*, David Brown, Banker, Maybole. 5 Medals. Granted 1872.

18. Coylton and Stair Society.—*Convener*, Major-General Burnett of Gadgirth, Tarbolton; *Secretary*, Robert Caldwell, Knockshoggle, Coylton, Ayr. 2 Medals. Granted 1874.

19. Craigie Society.—*Convener*, James Picken, Laigh Langside, Craigie, Kilmarnock; *Secretary*, Andrew M'Farlane, Schoolhouse, Craigie. 3 Medals. Granted 1874.

20. Dalry Society.—*Convener*, Andrew Allan, Munnoch, Dalry ; *Secretary*, Robert Craig, Flashwood, Dalry. 2 Medals. Granted 1872.

21. Dalrymple Society.—*Convener*, David Hunter, Guiltreehill, Kirkmichael ; *Secretary*, Wm. Alston, Hopetoun Cottage, Dalrymple, Ayr. 2 Medals. Granted 1876.

22. Darvel Horticultural Society.—*Convener*, J. Nisbet, Longgreen, Newmilns ; *Secretary*, John Jamieson, East Main Street, Darvel, Kilmarnock. 2 Medals. Granted 1876.

23. Girvan District Society.—*Convener*, Captain Hamilton of Pinmore; *Secretary*, Robert Lamb, Girvan. 2 Medals. Granted 1875.

24. Irvine Society.—*Convener*, James Stewart, Heathfield, Irvine; *Secretary*, A. C. M'Jannet, writer, Irvine. 2 Medals. Granted 1875.

25. Kilmarnock Club.—*Convener*, Frederick J. Turner, The Dean, Kilmarnock; *Secretaries*, James and W. H. Wilson, Kilmarnock. 3 Medals. Granted 1872 and 1874.

26. Kirkmichael Society.—*Convener*, John Rankine of Beoch, Lochlands, Maybole; *Secretary*, David Hunter, Cairnhill, Kirkmichael, Maybole. 4 Medals. Granted 1874.

27. Loudoun and Lanfine Society.—*Convener*, Robert Mackie, Loudoun Cottage, Galston; *Secretary*, Andrew Cameron, Solicitor, Newmilns. 2 Medals. Granted 1872.

28. Muirkirk Association.—*Convener*, James Baird of Cambusdoon, Ayr; *Secretary*, Alex. Donald, The Schoolhouse, Muirkirk. 6 Medals. Granted 1873.

29. New Cumnock Society.—*Convener*, John Hyslop of Bank, New Cumnock; *Secretary*, Wm. Lennox, Whitehill, New Cumnock. 4 Medals. Granted 1874.

30. Sorn Parish Association.—*Convener*, Charles Howatson of Dornel, Daldorch House, Mauchline; *Secretary*, David Miller, Park Terrace, Catrine. 4 Medals. Granted 1876.

31. Symington Society.—*Convener*, Col. J. G. Hay Boyd of Townend, Symington, Kilmarnock; *Secretary*, Wm. Wakelin, schoolmaster, Symington, Kilmarnock. 2 Medals. Granted 1874.

Banffshire.

32. Central Banffshire Club.—*Convener*, William Longmore, Keith; *Secretary*, James Geddes Brown, Keith. 6 Medals. Granted 1872 and 1873.

Berwickshire.

33. Lammermoor Pastoral Society.—*Convener*, John Turnbull of Abbey St Bathans; *Secretary*, John Caverhill, Greenburn, Ayton. 2 Medals. Granted 1875.

Dumbartonshire.

34. Cumbernauld Society.—*Convener*, John Wm. Burns of Kilmahew, Dumbarton; *Secretary*, George Anderson, Smithstown, Croy, Kilsyth. 3 Medals. Granted 1876.

35. Dumbartonshire Society.—*Convener*, Alex. Smollett of Bonhill, Cameron House, Alexandria, N.B.; *Secretary*, Wm. W. Murray, Catter House, Drymen. 4 Medals. Granted 1873 and 1874.

Dumfriesshire.

36. Annandale Farmers' Club.—*Convener*, J. J. Hope Johnstone of Annandale; *Secretary*, John Baird, jun., Lockerbie. 4 Medals. Granted 1875.

Edinburghshire.

37. Dalkeith Society.—*Convener*, Sir James Gardiner Baird, Bart., Inch House, Liberton; *Secretary*, James Wilson, Wester Cowden, Dalkeith. 6 Medals. Granted 1872.

Fifeshire.

38. Dunnikier Society.—*Convener*, J. T. Oswald of Dunnikier, Kirkcaldy; *Secretary*, John Kidd, Dunnikier, Kirkcaldy. 3 Medals. Granted 1874.

39. Windygates Society.—*Convener*, John Gilmour of Lundin, Leven; *Secretary*, John Laurie, Kirklandhill, Leven. 2 Medals. Granted 1875.

Inverness-shire.

40. Strathglass Society.—*Convener*,
Secretary, James Fraser, Mauld, Beauly. 2 Medals. Granted 1876.

41. Strathspey Society.—*Convener*, The Earl of Seafield; *Secretary*, Francis Macbean, Factor's Office, Grantown. 5 Medals. Granted 1872.

Kincardineshire.

42. Strachan Flower, Poultry, and Dairy Show.—*Convener*, John Masson, Mill of Cammie, Banchory; *Secretary*, Neil Gilchrist, Schoolhouse, Strachan, Banchory. 2 Medals. Granted 1874.

Lanarkshire.

43. Biggar Club.—*Convener*, John L. Murray of Heavyside, Biggar; *Secretary*, R. G. Murray, Spittal, Biggar. 3 Medals. Granted 1874.

44. Calder Waterhead Society.—*Convener*, Peter Forrest of Heirmyres, City of Glasgow Bank, Shotts; *Secretary*, James Ferguson, Fernieshaw, Holytown. 2 Medals. Granted 1873.

45. Upper Ward of Lanarkshire Association.—*Convener*, Andrew Smith, Castle Mains, Douglas; *Secretary*, James Symington, auctioneer, Lanark. 2 Medals. Granted 1874.

Linlithgowshire.

46. Bathgate Association.—*Convener*, John Waddell of Easter Inch, Bathgate; *Joint-Secretaries*, M. Chapman and G. M. Johnston, Bathgate. 4 Medals. Granted 1873.

Perthshire.

47. Dunning Society.—*Convener*, James Morison, Rossie, Dunning; *Secretary*, Wm. Bruce, merchant, Dunning. 1 Medal. Granted 1873.

48. Moulin Association.—*Convener*, Alex. Forbes, Pitfourie, Pitlochrie; *Secretary*, D. M'Gillewie, Pitlochry. 1 Medal. Granted 1873.

49. Scottish Midland Association.—*Convener*, Sir Wm. Stirling Maxwell of Keir, Bart., M.P., Dunblane; *Secretary*, Melville Jameson, Perth. 4 Medals. Granted 1872.

50. Strathearn Central Society.—*Convener*, William Morison, Cairnie, Forteviot; *Secretary*, Robert Gardiner, Chapel Bank, Auchterarder. 2 Medals. Granted 1872.

Renfrewshire.

51. Lower Ward of Renfrewshire Society.—*Convener*, Sir Michael R. Shaw Stewart of Ardgowan, Bart., Greenock; *Secretary*, D. L. Macadam, Mansion House, Greenock. 4 Medals. Granted 1873.

52. Mearns Society.—*Convener*, Wm. Mather of Waterfoot, Mearns; *Secretary*, John Pollock, Blackhouse, Newton Mearns. 2 Medals. Granted 1874.

53. Neilston Society.—*Convener*, John Holm, Jaapston, Neilston; *Secretary*, . 2 Medals. Granted 1876.

Stirlingshire.

54. Bucklyvie and Gartmore Association.—*Convener*, W. A. MacLachlan of Auchentroig, Balfron; *Secretary*, Andrew Dun, Kepdowrie, Bucklyvie. 2 Medals. Granted 1875.

Wigtownshire.

55. Kirkmaiden Society.—*Convener and Secretary*, Gilbert R. Murray, Chapelrossan, Stranraer. 4 Medals. Granted 1873.

The Medals are given for Five consecutive years.

Applications from other Districts must be lodged with the Secretary of the Society *by 1st November next.*

RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.

2. The classes for which Medals are granted must be in accordance with the list at pages 36 and 37. The Committee shall select the classes, and specify them in the return.

3. In each District the Convener (who must be a Member of the Society appointed by the Directors) shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other Members of the Society, and the local Association of the District.

4. The Money Premiums given in the District must be L.2 for each Medal claimed.

5. The Medal for Sheep Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest money premium. There must not be fewer than two competitors in all the classes.

6. Blank reports will be furnished to all the Conveners of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.

7. When a grant has expired, the District cannot apply again for aid for 2 years.

Section 8.—PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a member of the Society:—

FORM OF REPORT.

I, of Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the Association at in the county of on the when ploughs competed; of land was assigned to each, and hours were allowed for the execution of the work. The sum of L. was awarded in the following proportions, viz. :—

[Here enumerate the names and designations of successful Competitors.]

RULES OF COMPETITION.

1. All matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants on one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Society who was present at it.

5. A Member can only report one Match, and a Ploughman can only carry one Medal in the same season.

6. To warrant the Medal, there must have been twelve ploughs in Competition, and Three Pounds awarded in Premiums. The Medal to be given to the winner of the first or highest prize.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others: on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the firmness and sufficiency of the work below, more than to its neatness above the surface.

Section 9.—COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after-mentioned.

The Premiums for Cottages and Gardens are given for Five consecutive years.

1. PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1. Best kept Cottage in each Parish—One Pound; and where there are four Competitors—Minor Silver Medal.
   Second best—Ten Shillings.
   Third best—Minor Silver Medal.
2. Best kept Cottage Garden in each Parish—One Pound; and where there are four Competitors—Minor Silver Medal.
   Second best—Ten Shillings.
   Third best—Minor Silver Medal.

Aberdeenshire.

1. Crathie and Braemar.—*Convener and Secretary,* Dr Robertson, Indego, Tarland. Granted 1872.

Fifeshire.

2. Newburgh Gardening Society.—*Convener,* John Lyell, Newburgh; *Secretary,* Robert Clark, Newburgh. Granted 1874.

Kincardineshire.

3. Fettercairn Amateur Horticultural Society.—*Convener,* Lieut.-Col. M'Inroy of The Burn, Brechin; *Secretary,* James Robb, Fettercairn. Granted 1875.

Linlithgowshire.

4. Dalmeny and Queensferry Horticultural Society.—*Convener,* Peter Glendinning, Dalmeny Park, Edinburgh; *Secretary,* Arthur H. Glendinning, The Leuchold, Dalmeny Park, Edinburgh. Granted 1872.

5. Kirkliston Horticultural Association.—*Convener,* Peter Glendinning, Dalmeny Park, Edinburgh; *Secretary,* H. O. Grieve, Kirkliston. Granted 1874.

Perthshire.

6. Dunbarney, including that portion of Craigend in the parish of Perth.—*Convener,* Sir Thomas Moncreiffe of Moncreiffe, Bart., Bridge of Earn; *Secretary,* Henry Methven, Dunbarney House, Bridge of Earn. Granted 1874.

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Gentlemen's Lodges and Gardeners' Houses, as well as Gentlemen's Servants occupying Cottages in the Policies, or on land in the natural possession of their masters, are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The

inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the district to regulate the maximum annual rent of the Cottages, which may, with the garden, be from L.5 to L.7.

4. A person who has gained the highest premium cannot compete again, but will be entitled to a Medal if certified by the Committee to be equal in merit to the first on the list of Competitors.

5. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

6. In estimating the claims for the Garden Premiums, the judges should have in view:—The sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

7. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the 1st November next.*

8. When a Grant has expired the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the 1st November next.*

2. MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE.

The Society will issue annually two Medium Silver Medals to a limited number of local Associations or individuals, who at their own expense establish premiums for Cottages or Gardens under L.15 of Rent. The Medals may be awarded for best kept Cottage, and best kept Garden or Flower Plot, or Garden Produce.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the first of November next.* The Medals are given for five consecutive years.

Aberdeenshire.

1. KEIG CLUB.—*Convener,* Lord Forbes, Castle Forbes, Keig, Aberdeen; *Secretary,* George Bruce, Wealthiton, Keig. Granted 1873.

Ayrshire.

2. STEWARTON FARMER SOCIETY.—*Convener and Secretary,* John Lindsay, Avenue Square, Stewarton. Granted 1875.

Dumbartonshire.

3. VALE OF LEVEN AND DUMBARTON HORTICULTURAL SOCIETY.—*Convener,* Sir James Lumsden of Arden; *Secretary,* John C. Baird, Bridge Street, Alexandria, N.B. Granted 1872.

Edinburghshire.

4. ROSLIN HORTICULTURAL SOCIETY.—*Convener,* William Merricks, Roslin; *Secretary,* R. D. Glover, Roslin. Granted 1874.

Fifeshire.

5. Auchtermuchty and Strathmiglo Horticultural Society.—*Convener*, R. Cathcart of Pitcairlie; *Secretary*, James Clark, Auchtermuchty. Granted 1875.

Inverness-shire.

6. Badenoch and Rothiemurchus Horticultural Society.—*Convener*, Cluny Macpherson, Cluny Castle, Kingussie; *Secretary*, William Forrest, Kingussie. 2 Medals. Granted 1876.

Kincardineshire.

7. Fordoun, Glenbervie, and Arbuthnott Horticultural Society.—*Convener*, Lord Inverurie, Inglismaldie Castle, Laurencekirk; *Secretary*, Alexander Cruickshank, Gardener, Glenbervie House, Fordoun. 2 Medals. Granted 1876.

Lanarkshire.

8. Bothwell Horticultural Society.—*Convener*, *Secretary*, Wm. M'Nab, City of Glasgow Bank, Bothwell. 2 Medals. Granted 1876.

9. Hutchesontown Gardens.—*Secretary*, Robert Hamilton, 62 Camden Street (Southside), Glasgow. Granted 1872. (One year in abeyance).

10. Shettleston Horticultural Society.—*Secretary*, J. Bulloch Logan, Shettleston. Granted 1872.

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately.

2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed L.15.

3. If Competition takes place for Garden Produce in place of the best kept Garden, such produce must be *bona fide* grown in the Exhibitor's Garden, and he will not be allowed to make up a Collection from any other Garden.

4. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

5. When a grant has expired the District cannot apply again for aid for two years.

3. IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages during the years 1873, 1874, and 1875—The Gold Medal.

4. BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1872, 1873, 1874, and 1875—The Gold Medal.

RULES OF COMPETITION.

1. Claims for the Premiums Nos. 3 and 4 must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary *on or before the 1st of November.*

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed L.5.

3. In estimating the claims of the Competitors, the following points will be kept in view:—The external appearance of the Cottages; their internal accommodation; the arrangements of the out-houses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them the preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

ABERDEEN

ON 25TH, 26TH, 27TH, AND 28TH JULY 1876.

President of the Society.

His Royal Highness the PRINCE of WALES.

Chairman of the Local Committee.

ALEXANDER FORBES IRVINE, Esq. of Drum, Convener of Aberdeenshire.

The District connected with the Show comprises the Counties of ABERDEEN, BANFF, and KINCARDINE, and Eastern Division of FORFARSHIRE.

GENERAL ARRANGEMENTS.

STOCK AND POULTRY.

To be entered with the Secretary on or before Friday, 9th June. Received in the Yard on Monday, 24th, and till noon on Tuesday, 25th July. Judged at 1 P.M. on Tuesday. Exhibited on Tuesday, Wednesday, Thursday, and Friday, 25th, 26th, 27th, and 28th July.

IMPLEMENTS

To be entered with the Secretary on or before Friday, 9th June. Received in the Yard on Tuesday, 18th July, and till the evening of Monday, 24th July. Exhibited Tuesday, Wednesday, Thursday, and Friday, 25th, 26th, 27th, and 28th July.

TERMINATION OF SHOW.

Friday, 28th July, at 5 P.M. Stock and Implements may remain in the Yard till Saturday afternoon.

The Competition is open to Exhibitors from all parts of the United Kingdom.

Members of the Society are admitted free during the Show.

New Members may be proposed for election at the General Meeting in June, and if on the list of Candidates may enter at Members' rates; but all entries must be made on or before Friday, 9th June.

PREMIUMS.

The Medium Gold Medal will be given to any animal which, having gained the Society's highest Premium at Inverness 1874, *or Glasgow* 1875, *in the Classes of Aged Bulls—Cows—Stallions—or Mares, is disqualified from again competing.* See General Conditions Nos. 23 and 24.

In addition to the Premiums, the Judges are authorised to award three Commendations in each section if the entries are numerous, and the animals of sufficient merit. These Commendations to consist of—Very Highly Commended, Highly Commended, and Commended. See General Conditions, No. 25.

CLASS I.—CATTLE.

SECTION — SHORT-HORN.

1.	Best Bull calved before 1st Jan. 1874,	£25
	Second best,	15
	Third best,	10
	Breeder of best Bull, The Silver Medal.	
2.	Best Bull calved after 1st Jan. 1874,	25
	Second best,	15
	Third best,	10
3.	Best Bull calved after 1st Jan. 1875,	15
	Second best,	10
	Third best,	5
4.	Best Cow of any age,	20
	Second best,	10
	Third best,	5
5.	Best Heifer, with own calf at foot, calved after 1st Jan. 1874,	15
	Second best,	10
	Third best,	5
6.	Best Heifer calved after 1st Jan. 1874,	15
	Second best,	10
	Third best,	5
7.	Best Heifer calved after 1st Jan. 1875,	10
	Second best,	8
	Third best,	4
		£247

POLLED ANGUS OR ABERDEEN.

8.	Best Bull calved before 1st Jan. 1874,	£20	
	Second best,	10	
	Third best,	5	
	Fourth best,	3	
	Breeder of best Bull, The Silver Medal.		
	Carry forward	£38	£247

POLLED ANGUS OR ABERDEEN—*continued.*

Section			
	Brought forward,	£38	£247
9.	Best Bull calved after 1st Jan. 1874,	20	
	Second best,	10	
	Third best,	5	
	Fourth best,	3	
10.	Best Bull calved after 1st Jan. 1875,	10	
	Second best,	5	
	Third best,	3	
	Fourth best,	2	
11.	Best Cow of any age,	20	
	Second best,	10	
	Third best,	5	
	Fourth best,	3	
12.	Best Heifer, with own calf at foot, calved after 1st Jan. 1874,	10	
	Second best,	6	
	Third best,	4	
	Fourth best,	2	
13.	Best Heifer calved after 1st Jan. 1874,	10	
	Second best,	6	
	Third best,	4	
	Fourth best,	2	
14.	Best Heifer calved after 1st Jan. 1875,	8	
	Second best,	5	
	Third best,	3	
	Fourth best,	1	
		——	195

GALLOWAY.

15.	Best Bull calved before 1st Jan. 1874,	20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull, The Silver Medal.		
16.	Best Bull calved after 1st January 1874,	20	
	Second best,	10	
	Third best,	5	
17.	Best Bull calved after 1st Jan. 1875,	10	
	Second best,	5	
	Third best,	3	
18.	Best Cow of any age,	20	
	Second best,	10	
	Third best,	5	
19.	Best Heifer calved after 1st Jan. 1874,	10	
	Second best,	6	
	Third best,	4	
20.	Best Heifer calved after 1st Jan. 1875,	8	
	Second best,	5	
	Third best,	3	
		——	159
	Carry forward,		£601

Section			
	Brought forward,		£601
	AYRSHIRE.		
21.	Best Bull calved before 1st Jan. 1874,	£20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull, The Silver Medal.		
22.	Best Bull calved after 1st Jan. 1874,	15	
	Second best,	8	
	Third best,	5	
23.	Best Bull calved after 1st Jan. 1875,	10	
	Second best	5	
	Third best	3	
24.	Best Cow in Milk of any age,	20	
	Second best,	10	
	Third best,	5	
25.	Best Cow in Calf, of any age, or Heifer in Calf, calved before 1st Jan. 1874,	15	
	Second best,	10	
	Third best,	5	
26.	Best Heifer calved after 1st Jan. 1874,	10	
	Second best,	6	
	Third best,	4	
27.	Best Heifer calved after 1st Jan. 1875,	8	
	Second best,	5	
	Third best,	3	
		——	182
	HIGHLAND.		
28.	Best Bull calved before 1st Jan. 1873,	20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull, The Silver Medal		
29.	Best Bull calved after 1st Jan. 1873,	20	
	Second best,	10	
	Third best,	5	
30.	Best Bull calved after 1st Jan. 1874,	10	
	Second best,	5	
	Third best,	3	
31.	Best Cow of any age,	15	
	Second best,	8	
	Third best,	4	
32.	Best Heifer calved after 1st Jan. 1873,	10	
	Second best,	5	
	Third best,	3	
33.	Best Heifer calved after 1st Jan. 1874,	8	
	Second best,	4	
	Third best,	2	
		——	147
	Carry forward		£930

Section			
	Brought forward,		£930
	FAT STOCK.		
34.	Best Highland Ox calved after 1st Jan. 1872,	£6	
	Second best,	3	
35.	Best Highland Ox calved after 1st Jan. 1873,	5	
	Second best,	2	
36.	Best Polled Ox calved after 1st Jan. 1873,	6	
	Second best,	3	
37.	Best Ditto, calved after 1st Jan. 1874,	5	
	Second best,	2	
38.	Best Ox, of any other Pure or Cross Breed calved after 1st Jan. 1873,	8	
	Second best,	4	
	Third best,	2	
39.	Best Ditto, calved after 1st Jan. 1874,	6	
	Second best,	3	
	Third best,	1	
40.	Best Cross-bred Heifer, calved after 1st Jan. 1873,	8	
	Second best,	4	
	Third best,	2	
41.	Best Cross-bred Heifer, calved after 1st Jan. 1874,	6	
	Second best,	3	
	Third best,	1	
			80
			£1010

CLASS II.—HORSES

FOR AGRICULTURAL PURPOSES.

1.	Best Stallion foaled before 1st Jan. 1873,	£30
	Second best,	20
	Third best,	10
	Fourth best,	5
	Breeder of best Stallion, The Silver Medal.	
2.	Best Entire Colt foaled after 1st Jan. 1873,	20
	Second best,	15
	Third best,	10
	Fourth best,	5
3.	Best Entire Colt foaled after 1st Jan. 1874,	15
	Second best,	8
	Third best,	4
	Fourth best,	2
4.	Best Entire Colt foaled after 1st Jan. 1875,	10
	Second best,	6
	Third best,	4
	Fourth best,	2
	Carry forward,	£166

HORSES FOR AGRICULTURAL PURPOSES—*continued.*

Section			
	Brought forward,		£166
5.	Best Mare (with Foal at foot) foaled before 1st Jan. 1873,		25
	Second best,		15
	Third best,		10
	Fourth best,		5
6.	Best Mare (in Foal) foaled before 1st Jan. 1873,		20
	Second best,		10
	Third best,		5
	Fourth best,		3
7.	Best Filly foaled after 1st Jan. 1873,		10
	Second best,		5
	Third best,		3
	Fourth best,		2
8.	Best Filly foaled after 1st Jan. 1874,		8
	Second best,		4
	Third best,		2
	Fourth best,		1
9.	Best Filly foaled after 1st Jan. 1875,		6
	Second best,		4
	Third best,		2
	Fourth best,		1
10.	Best Draught Gelding foaled before 1st Jan. 1873,		8
	Second best,		4
	Third best,		2
11.	Best Draught Gelding, foaled after 1st Jan. 1873,		6
	Second best,		3
	Third best,		1
			£331

HUNTERS AND ROADSTERS.

12.	Best Mare or Gelding, suitable for Field, foaled before 1st Jan. 1872,	£20	
	Second best,	10	
	Third best,	5	
13.	Best Mare or Gelding, suitable for Carriage, foaled before 1st Jan. 1872,	20	
	Second best,	10	
	Third best,	5	
14.	Best Mare or Gelding, suitable as Hackney or Roadster, between 14 and 15 hands high,	8	
	Second best,	4	
	Third best,	2	
15.	Best Stallion, Mare, or Gelding, for leaping,	10	
	Second best,	5	
	Third best,	3	
			102
	Carry forward,		£433

Section			
	Brought forward		£433
	PONIES.		
16.	Best Highland Stallion, 14½ hands and under, .	6	
	Second best, ...	3	
	Third best, ...	1	
17.	Best Highland Mare or Gelding, between 13 and 14½ hands high, ...	6	
	Second best, ...	3	
	Third best, ...	1	
18.	Best Mare or Gelding, between 13 and 14 hands high, ...	6	
	Second best, ...	3	
	Third best, ...	1	
19.	Best Mare or Gelding, between 12 and 13 hands high, ...	6	
	Second best, ...	3	
	Third best, ...	1	
20.	Best Mare or Gelding, 12 hands and under, .	6	
	Second best, ...	3	
	Third best, ...	1	
			50
	THOROUGH-BRED STALLIONS.		
	Best Thorough-bred Stallion to serve in the District of the Show in season 1876. (This Premium was competed for at Aberdeen on 4th February 1876), ...		50
			£533

CLASS III.—SHEEP.

	CHEVIOT.	
1.	Best Tup above one shear, ...	£12
	Second best, ...	8
	Third best, ...	4
	Fourth best, ...	2
2.	Best Shearling Tup, ...	12
	Second best, ...	8
	Third best, ...	4
	Fourth best, ...	2
3.	Best 5 Ewes above one shear, ...	10
	Second best, ...	5
	Third best, ...	2
	Best Pen of Lambs shown with Ewes, . . .	2
	Second best, ...	1
	Carry forward,	£72

CHEVIOT—*continued.*

SECTION			
	Brought forward,		£72
4. Best 5 Shearling Ewes or Gimmers,			10
Second best,			5
Third best,			2
			89

BLACKFACED.

5. Best Tup above one shear,	12	
Second best,	8	
Third best,	4	
Fourth best,	2	
6. Best Shearling Tup,	12	
Second best,	8	
Third best,	4	
Fourth best,	2	
7. Best 5 Ewes above one shear,	10	
Second best,	5	
Third best,	2	
Best Pen of Lambs shown with Ewes,	2	
Second best,	1	
8. Best 5 Shearling Ewes or Gimmers,	10	
Second best,	5	
Third best,	2	
		89

BORDER LEICESTER.

9. Best Tup above one shear,	12	
Second best,	8	
Third best,	4	
Fourth best,	2	
10. Best Shearling Tup,	12	
Second best,	8	
Third best,	4	
Fourth best,	2	
11. Best 5 Ewes above one shear,	10	
Second best,	5	
Third best,	2	
12. Best 5 Shearling Ewes, or Gimmers,	10	
Second best,	5	
Third best,	2	
		86

LEICESTER.

13. Best Tup of any age,	8	
Second best,	4	
Third best,	2	
14. Best 5 Ewes of any age, or Gimmers,	6	
Second best,	3	
Third best,	1	
		24
Carry forward,		£288

Section			
	Brought forward,		£288
	COTSWOLD.		
15.	Best Tup of any age,	£8	
	Second best,	4	
	Third best,	2	
16.	Best 5 Ewes of any age, or Gimmers,	6	
	Second best,	3	
	Third best,	1	
		——	24
	LINCOLN.		
17.	Best Tup of any age,	8	
	Second best,	4	
	Third best,	2	
18.	Best 5 Ewes of any age, or Gimmers,	6	
	Second best,	3	
	Third best,	1	
		——	24
	SOUTHDOWN.		
19.	Best Tup of any age,	8	
	Second best,	4	
	Third best,	2	
20.	Best 5 Ewes of any age, or Gimmers,	6	
	Second best,	3	
	Third best,	1	
		——	24
	SHROPSHIRE.		
21.	Best Tup of any age,	8	
	Second best,	4	
	Third best,	2	
22.	Best 5 Ewes of any age, or Gimmers,	6	
	Second best,	3	
	Third best,	1	
		——	24
	EXTRA SHEEP.		
23.	Best 5 Cheviot Wethers, not above 3 shear,	4	
	Second best,	2	
24.	Best 5 Blackfaced Wethers, not above 4 shear,	4	
	Second best,	2	
25.	Best 5 Wether Hoggs of any cross, not above 1 shear,	4	
	Second best,	2	
		——	18
			£402

CLASS IV.—SWINE.

Section			
	LARGE BREED.		
1.	Best Boar,		£8
	Second best,		4
	Third best,		2
2.	Best Sow,		6
	Second best,		3
	Third best,		1
3.	Best Pen of 3 Pigs, not above 8 months old,		4
	Second best,		2
	Third best,		1
			£31
	BERKSHIRE.		
4.	Best Boar,	£8	
	Second best,	4	
	Third best,	2	
5.	Best Sow,	6	
	Second best,	3	
	Third best,	1	
6.	Best Pen of 3 Pigs, not above 8 months old,	4	
	Second best,	2	
	Third best,	1	
			31
	SMALL BREED.		
7.	Best Boar,	8	
	Second best,	4	
	Third best,	2	
8.	Best Sow,	6	
	Second best,	3	
	Third best,	1	
9.	Best Pen of 3 Pigs, not above 8 months old,	4	
	Second best,	2	
	Third best,	1	
			31
			£93

EXTRA STOCK.

Animals not included in the Sections for Competition may be exhibited as Extra Stock, and will receive Honorary Premiums when specially commended.

CLASS V.—POULTRY.

First Premium—One Sovereign; Second Premium—Ten Shillings—in all the Sections of Poultry.

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1876.

	Section	*Section*
Dorking—*Silver Grey*, .	1. Cock.	2. 2 Hens.
	3. Cockerel.	4. 2 Pullets.
Dorking—*Coloured*, .	5. Cock.	6. 2 Hens.
	7. Cockerel.	8. 2 Pullets.
Cochin-China, . .	9. Cock.	10. 2 Hens.
	11. Cockerel.	12. 2 Pullets.
Brahmapootra, . .	13. Cock.	14. 2 Hens.
	15. Cockerel.	16. 2 Pullets.
Spanish, . . .	17. Cock.	18. 2 Hens.
	19. Cockerel.	20. 2 Pullets.
Scotch Grey, . .	21. Cock.	22. 2 Hens.
	23. Cockerel.	24. 2 Pullets.
Hamburg—*Pencilled*, .	25. Cock.	26. 2 Hens.
	27. Cockerel.	28. 2 Pullets.
Hamburg—*Spangled*, .	29. Cock.	30. 2 Hens.
	31. Cockerel.	32. 2 Pullets.
Polish, . . .	33. Cock.	34. 2 Hens.
	35. Cockerel.	36. 2 Pullets.
Game—*Black or Brown Reds*, . . .	37. Cock.	38. 1 Hen.
	39. Cockerel.	40. 1 Pullet.
Game—*Duckwings, or any other variety*, .	41. Cock.	42. 1 Hen.
	43. Cockerel.	44. 1 Pullet.
Bantams—*Game*, . .	45. Cock.	46. 1 Hen.
	47. Cockerel.	48. 1 Pullet.
Bantams—*Sebright*, .	49. Cock.	50. 2 Hens.
	51. Cockerel.	52. 2 Pullets.
Bantams—*Any other Variety*, . . .	53. Cock.	54. 2 Hens.
	55. Cockerel.	56. 2 Pullets.
Any other Pure Breed of Poultry, . .	57. Cock.	58. 2 Hens.
	59. Cockerel.	60. 2 Pullets.
Ducks—*White Aylesbury*,	61. Drake.	62. 2 Ducks.
	63. Drake (Young).	64. 2 Ducklings.
Ducks—*Rouen*, . .	65. Drake.	66. 2 Ducks.
	67. Drake (Young).	68. 2 Ducklings.
Ducks—*Any other Pure Breed*, . . .	69. Drake.	70. 2 Ducks.
	71. Drake (Young).	72. 2 Ducklings.
Turkeys—*Black Norfolk*,	73. Cock.	74. 2 Hens.
	75. Cock (Poult).	76. 2 Hens (Poults).
Turkeys—*Any other Breed*,	77. Cock.	78. 2 Hens.
	79. Cock (Poult).	80. 2 Hens (Poults).
Geese—*Grey Toulouse*,	81. Gander.	82. 2 Geese.
	83. Gander (Young).	84. 2 Goslings.

POULTRY—*continued.*

	Section.	*Section.*
GEESE—*Embden*, . .	85. Gander.	86. 2 Geese.
	87. Gander (Young).	88. 2 Goslings.
GEESE—*Any other Pure Breed*, . . .	89. Gander.	90. 2 Geese.
	91. Gander (Young).	92. 2 Goslings.

Total amount of Poultry Premiums, £138.

CLASS VI.—IMPLEMENTS, &c.

NOTE.—*Under Implements are included those for Agriculture, Horticulture, and Forestry.*

Special Premiums will be awarded on the Report by the Implement Committee for

1. Machines for Thinning Turnips.
2. Machines for Spreading Manure.

Reference is made to the General Regulations for the terms on which other Implements may be exhibited, and the conditions under which they will be tried and rewarded.

The Inspecting Committee may award such Silver Medals as they deem proper, or recommend Implements for trial.

In addition, it is competent for the Local Committee to select any description of Implement they think proper for special trial. See Rule 59.

Collections of Articles not Agricultural will be received for exhibition, but such Collections will not be inspected by the Judges. See Rule 60.

ABSTRACT OF PREMIUMS.

1. Cattle, ...	£1010	0	0
2. Horses, ...	533	0	0
3. Sheep, ...	402	0	0
4. Swine, ...	93	0	0
5. Poultry, ...	138	0	0
6. Medium Gold Medals to former Prize Animals, say . . .	160	0	0
7. Six Silver Medals to Breeders of best Aged Bulls and best Stallion, . .	4	16	0
8. Extra Stock, say . . .	40	0	0
9. Implements, say . . .	60	0	0
	£2440	16	0

REGULATIONS.

GENERAL CONDITIONS.

1. Members of the Society are admitted to the Show-Yard without payment, on exhibiting a "*Member's Ticket.*" Tickets will be sent to all Members residing in the Counties connected with the Show—Aberdeen, Banff, and Kincardine, and Eastern Division of Forfarshire. Members residing in other localities must apply for Tickets at the Secretary's Office, 3 George IV. Bridge, Edinburgh, *not later than the 15th of July.*

2. No animal to be allowed to compete in more than one section, except Horses in Sections 12, 13, and 14, which may be also entered in Section 15.

3. All animals must be entered in the section applicable to their ages, and cannot be withdrawn after entry.

4. Stock must be *bona fide the property and in the possession of* the Exhibitor from the 9th June (the last day of Entry).

5. The schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and the name of the Breeder, if known, must be given.

6. Breeding Stock must not be shown in an improper state of fatness, and the Judges will be prohibited from awarding Premiums to overfed animals.

7. The Competition of Thorough-bred Stallions takes place in spring.

8. No animal shall bear on its rug, harness, pail, or other fittings, any initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

9. Any artificial contrivance or device of any description found on an animal either for preventing the flow of milk or for any other purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal will be prohibited from again entering stock for any of the Society's General Shows.

10. No animal to be taken out of its stall after 10 A.M. during the Show, except by order of the Judges, or with permission of the Secretary. Those infringing this Rule will be fined 10s.

11. Aged Bulls and Stallions must have had produce, and, along with Two-year-old Bulls and Three-year-old Colts, have served within the year of the Show.

12. All Cows must have had calves previous to the Show, and when exhibited, they must either be in milk or in calf; if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show. In the case of Ayrshire Heifers in Calf, calved before 1st January 1874, birth must be certified within 9 months after the Show.

13. All Milch Cows must have been milked dry the evening previous to being judged, and they must, while within the Show-Yard, be milked morning and evening. The Judges will be instructed to withhold the prizes from any animals overstrained or suffering from want of being milked.

14. Two-year-old Heifers—of the Short-horn and Polled Breeds—must be in calf when exhibited, and the premiums will be withheld till birth be certified, which must be within 9 months after the Show.

15. Mares in Section 5 must have produced foals after 1st January 1876, and foals must be at foot, except when death can be proved. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified, which must be within 11 months from the date of the Show.

16. With reference to regulations 12 and 14, birth of at least a seven months' calf must be certified; and in regard to regulation 15, birth of at least a nine months' foal.

17. Horses entered as suitable for Field are expected to be jumped in the Horse Ring, but this is not compulsory except when the animals are being judged, and then only if required by the Judges. Those entered for leaping must be jumped in the Horse-Ring at each Parade during the Show.

18. The inspection of Horses as to soundness is left entirely to the Judges, who may consult the Society's Veterinary Surgeon if they deem it expedient.

19. No protests on veterinary grounds will be received.

20. All Ewes must have reared Lambs in 1876; and Ewes in Sections 3 and 7 (Cheviot and Blackfaced) must be in milk, and have their Lambs at foot. Fleeces must not be artificially coloured.

21. Sows must have reared pigs in 1876, or be in pig; and Pigs must belong to the same litter, and be uncut.

22. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1876. In the sections for Hens and Pullets of the Game and Malay Breeds, the lots to consist of one bird only.

23. An animal which has gained a first premium at a General Show of the Society cannot again compete in the same section.

24. First prize animals in the classes of Aged Bulls, Cows, Stallions, and Mares may be shown for the Medium Gold Medal at two consecutive Shows after gaining the first prize.

25. In addition to the Premiums, the Judges are authorised to award three Commendations in each section if the entries are numerous and the animals of sufficient merit. These Commendations to consist of—Very Highly Commended, Highly Commended, and Commended.

26. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a Member, struck from the roll.

27. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

28. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him.

29. Protests against the awards of the Judges must be lodged with the Secretary not later than 9 A.M. on Wednesday, 26th July, and parties must be in attendance at the Committee-Room, in the Show-Yard, at 10 A.M. that day, when protests will be disposed of.

30. Protests lodged for causes which the protestor produces no good evidence to substantiate, will render him liable to be reported to the Board of Directors, with the view, if they see reason, to his being prohibited from again entering stock for a General Show.

31. The Society shall not be liable for any loss or damage which Stock, Implements, or other articles may sustain at the Show, or in consequence of having been sent to it.

32. The decisions of the Board of Directors are final in all questions respecting Premiums, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

33. The Premiums awarded will be paid in November 1876, and, with the exception of Silver Medals, may be taken either in money or in plate.

CERTIFICATES OF ENTRY.

34. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Friday, the 9th of June.* Printed forms will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh.

ADMISSION OF STOCK.

35. The Yard will be open for Stock on Monday, 24th July, and between Six and Twelve o'clock on the morning of Tuesday, 25th, after which hour no Stock can be admitted.

36. One Servant will be admitted in charge of each Lot. Bulls must be secured by a nose ring, with chain or rope attached, or with strong halters and double ropes, with a man on each side.

37. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope to carry their forage. Covered accommodation will be erected for the whole of the Stock. Straw, hay, grass, and tares will be provided free by the Society during the four days of the Show; other kinds of food will be supplied at fixed prices in the forage yard. Any Servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, nor straw.

38. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule will be detained till all the other Stock is removed.

39. Cattle, Sheep, or Swine cannot be removed from the Yard till 5 P.M. on Friday, 28th July, except on certificate by the Veterinary Surgeon employed by the Directors.

40. Horses may be withdrawn at 6 each evening on a deposit of £2 for each animal, which shall be forfeited if the animal is not brought back at Half-past 7 o'clock the following morning. Those not in before 8 will forfeit 10s.

41. Smoking is strictly prohibited in the sheds, stables, and horse-ring gallery, and no lights allowed at night. Those infringing this Rule will be fined 10s.

JUDGING STOCK.

42. On Tuesday, 25th July, Exhibitors, and all others except Servants in charge of Stock, must leave the Yard at 12 noon. The Judges will commence their inspection at 1 P.M., when the public will be admitted. There shall be no award unless the Judges deem the animals to have sufficient merit, more especially if there is only one lot in a Section; and it shall be in their power to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

43. Two Members of Committee will attend each Section of the Judges. It will be their duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to communicate to the Secretary any question that may arise for the consideration of the Committee; to complete their reports; and to ticket the prize animals.

44. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or Attending Member in any class in which he is competing; and no Exhibitor shall remain in charge of any lot, whether belonging to himself or another, while the Judges are in the Yard.

PLACING AND JUDGING POULTRY.

45. Poultry must be brought to the Show-Yard on Monday, 24th July, or between 6 and 12 o'clock on the morning of Tuesday, 25th July. No lot will be admitted without an Admission-order. Coops, food, and attendance will be found by the Society.

46. The Judges will commence their inspection at 1 P.M. on Tuesday.

47. No lot to be removed from the Yard till 5 P.M. on Friday. The Society shall not be liable for any loss or accident sustained in transit or otherwise.

PLACING, INSPECTING, AND JUDGING IMPLEMENTS.

48. All articles must be entered with the Secretary on or before 9th June. They will be placed in their Classes, viz.:—all under cover, part under cover and part open, and all open, and Exhibitors must intimate whether they wish their goods placed under cover or not, and specify the space they require. For Rates, see Stall Rent.

49. The Yard will be open for the reception of Implements on Tuesday, 18th July, and till 10 A.M. on Tuesday, 25th July.

50. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement.

51. The carriage of all Implements must be prepaid.

52. The articles of each Exhibitor will be all placed in one stand, and must not on any account extend beyond the 20 feet of width allowed.

53. No Steam Engine shall be driven in the Yard at a greater speed than 6 miles an hour.

54. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Secretary, and must not leave the Yard at the close of the Show till 5.30 P.M.

55. All Machines requiring steam or fire must be entered as such in the Certificate, and will be placed in the Motion Yard. Coke must be used in all cases where fire is required.

56. The Inspecting Committee may award such Silver Medals as they deem proper, or recommend Implements for trial.

57. If an Exhibitor has already received a Premium from the Society he shall not receive a second award for the same invention or implement.

58. When an Implement or Machine is supposed to embrace a new invention, or improvement, the nature of such must be specified in the entry. When a trial is recommended by the Inspecting Committee, such trial will be instituted in a convenient locality, and at a season of the year suitable for the operation of the implement or machine, which, when thoroughly tested, will be entitled to such a Premium as the Directors may see fit to award, on the report of the Judges employed by them.

59. In addition, it is competent for the Local Committee to select any description of Implement they think proper for special trial. Such trial shall be conducted by the Local Committee, who shall undertake the whole arrangements for carrying out the same at a period of the year they consider suitable. The Directors shall award such Money Prizes or Medals on account of the Competitive Trials as may be arranged with the Local Committee.

60. Collections of Articles not Agricultural will be received for Exhibition, but such Collections will not be inspected by the Judges.

61. All articles must remain in the Yard till 5 P.M. on Friday, the 28th July, and may be kept there till the afternoon of Saturday.

STALL RENT.

Closed-in stables will be provided for all the horses, and covered accommodation for the whole of the other stock. Night accommodation will be provided for Attendants on Stock, and those requiring the same must make application when they return their Entry Schedules, and remit the charge along with their stall rent. The following rates shall be paid by Exhibitors when making their Entries:—

	Members.		Non-Members.	
	s.	*d.*	*s.*	*d.*
Cattle,	10	0	20	0
Stallions—3 and 2 year old entire Colts,	20	0	30	0
All other Horses,	15	0	25	0
Sheep and Swine, per pen,	8	0	15	0
Night accommodation for Attendants, each,	12	0	15	0
Poultry, each entry,	2	0	3	0
Implement Shedding, 20 feet deep, per foot,	2	0	3	0
Implements without Shedding, do., per foot,	Free*		1	0

No smaller space than 6 feet frontage can be allowed for Implements.

* The extent of open space given free to Implement Exhibitors who are Members of the Society is limited to 50 feet by 20; for additional space the charge is 1s. per foot.

Covered Booths for Offices can be had from £3, 10s. to Members, and £5 to Non-Members, according to size. Intimation to be made to the Secretary before the 1st of July.

ADMISSION-ORDERS.

Admission-Orders will be forwarded to Exhibitors by post previous to the Show.

ADMISSION OF PUBLIC.

The public will be admitted on Tuesday, 25th July, at 1 P.M., when the inspection by the Judges commences. Holders of Members' Tickets are admitted free; Exhibitors of Stock (not Members) will be charged 5s. for admission to the judging; all others 10s. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted.

Exhibitors of Implements and their attendants will be entitled to free entry during the Show, but must remain at their stalls during the judging of the stock on Tuesday.

On Wednesday, at 8 A.M., and throughout the Show, holders of Members' Tickets and Exhibitors will be admitted free.

The charges to others will be—Wednesday, from 8 A.M. till 5 P.M., 2s. 6d.; Thursday, from 8 A.M. till 1 P.M., 2s. 6d., after 1 o'clock, 1s.; Friday, from 8 A.M. till 12 noon, 1s., and from 12 till 5 P.M. 6d.

Placards are prohibited both inside the Show-Yard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale. No strolling bands admitted.

Premium Lists, Regulations, and Certificates of Entry, may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids.

All Communications should be addressed to FLETCHER NORTON MENZIES, Esq., *Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.*

LAST DAY OF ENTRY—FRIDAY, 9TH JUNE.

RAILWAY ARRANGEMENTS

IN ACCORDANCE WITH CLEARING-HOUSE REGULATIONS.

1. Stock and implements to the Show to be charged full rates.
2. From the Show, if sold, full rates.
3. From the Show, if unsold, to be conveyed at *half rates* back to the station whence they were sent, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold.
4. All the above to be carried at owners' risk.

5. When agricultural machines and implements are carried under these regulations to and from shows, they must be invoiced station to station at the ordinary rates. Collection and delivery at sending station, and delivery to, or collection from, the Show-Yard to be performed by, or at the expense of the owners.

6. Regulations Nos. 1, 2, and 3, as to Cattle and Horses, to apply only if the traffic be conveyed in Cattle Waggons and by Goods Trains.

7. Poultry and Dogs to be charged full rates both ways.

8. No reduction in the ordinary rates for Horses or Cattle when conveyed in Horse-boxes.

9. Parties requiring the exclusive use of a Horse-box for only one animal to be charged one fare and a half.

The North British, the Caledonian, the Glasgow and South-Western, the Highland, Great North of Scotland, and the North Eastern Railway Companies have adopted the above Clearing-House Regulations.

F. N. MENZIES, *Secy.*

3 GEORGE IV. BRIDGE, EDINBURGH.
10*th February* 1876.

GENERAL SHOW OF STOCK AND IMPLEMENTS

At EDINBURGH, 1877.

The District connected with the Show comprises the Counties of Edinburgh, Haddington, and Linlithgow.

Premiums will be offered for the following Classes :—

CATTLE.

SHORT-HORN.

Bulls calved before 1st January.....1875
Bulls calved after 1st January 1875
Bulls calved after 1st January 1876
Cows of any age.
Heifers calved after 1st January 1875
Heifers calved after 1st January 1876

POLLED ANGUS OR ABERDEEN.

Bulls calved before 1st January.....1875
Bulls calved after 1st January 1875
Bulls calved after 1st January 1876
Cows of any age.
Heifers calved after 1st January 1875
Heifers calved after 1st January 1876

GALLOWAY.

Bulls calved before 1st January.....1875
Bulls calved after 1st January 1875
Bulls calved after 1st January 1876
Cows of any age.
Heifers calved after 1st January 1875
Heifers calved after 1st January 1876

AYRSHIRE.

Bulls calved before 1st January.....1875
Bulls calved after 1st January 1875
Bulls calved after 1st January 1876
Cows in milk of any age.
Cows in calf of any age, or Heifers in calf calved before 1st January 1875
Heifers calved after 1st January 1875
Heifers calved after 1st January 1876

HIGHLAND.

Bulls calved before 1st January 1874
Bulls calved after 1st January 1874
Bulls calved after 1st January 1875
Cows of any age.
Heifers calved after 1st January 1874
Heifers calved after 1st January 1875

FAT STOCK.

Highland Oxen calved after 1st January 1873
Highland Oxen calved after 1st January 1874
Polled Oxen calved after 1st January 1874
Polled Oxen calved after 1st January 1875
Oxen of any other pure or cross breed calved after 1st January 1874
Oxen of any other pure or cross breed calved after 1st January 1875
Cross-bred Heifers calved after 1st January.....1874
Cross-bred Heifers calved after 1st January.....1875

HORSES

For Agricultural Purposes.

Stallions foaled before 1st January.....1874
Entire Colts foaled after 1st January 1874
Entire Colts foaled after 1st January 1875
Entire Colts foaled after 1st January 1876
Mares with foal at foot, foaled before 1st January 1874
Mares in foal, foaled before 1st January 1874
Fillies foaled after 1st January.....1874
Fillies foaled after 1st January.....1875
Fillies foaled after 1st January.....1876
Draught Geldings foaled before 1st January 1874
Draught Geldings foaled after 1st January 1874

THOROUGH-BRED STALLIONS.

Thorough-bred Stallions to serve in the District of the Show in Season 1877. To be shown at Edinburgh in Spring 1877.

HUNTERS AND ROADSTERS.

Brood Mares, with foals at foot, suitable for field.
Yeld Mares or Geldings, suitable for field, heavy weight, foaled before 1st January.....1873
Yeld Mares or Geldings, suitable for field, light weight, foaled before 1st January 1873
Mares or Geldings, suitable for field, foaled after 1st January ···1873
Mares or Geldings, suitable for field, foaled after 1st January ...1874
Mares or Geldings, suitable for carriage, foaled before 1st January 1873
Mares or Geldings, suitable as Hackneys or Roadsters, between 14 and 15 hands high.
Stallions, Mares, or Geldings, for leaping.

PONIES.

Highland Stallions 14½ hands and under.
Highland Mares or Geldings between 13 and 14½ hands high.
Mares or Geldings between 12½ and 14 hands high.
Mares or Geldings under 12½ hands.

SHEEP.

Ewes, Gimmers, Wethers, and Hoggs to be exhibited in pens of five.

CHEVIOT.

Tups three shear and upwards.
Tups two shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

BLACKFACED.

Tups three shear and upwards,
Tups two shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

BORDER LEICESTER.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers

LEICESTER.

Tups of any age.
Ewes of any age, or Gimmers.

COTSWOLD.

Tups of any age.
Ewes of any age, or Gimmers.

LINCOLN.

Tups of any age.
Ewes of any age, or Gimmers.

SOUTHDOWN.

Tups of any age.
Ewes of any age, or Gimmers.

SHROPSHIRE.

Tups of any age.
Ewes of any age, or Gimmers.

EXTRA SHEEP.

Cheviot Wethers not above three shear.
Blackfaced Wethers not above four shear.
Wether Hoggs of any cross not above one shear.

Sheep not included in the above Classes must be entered as Extra Stock.

WOOL.

Best Woolled Tup of the Cheviot, Blackfaced, and Leicester Breeds.

SWINE.

Pigs to be exhibited in pens of three.

LARGE BREED.

Boars.
Sows.
Pigs not above 8 months old.

BERKSHIRE.

Boars.
Sows.
Pigs not above 8 months old.

SMALL BREED.

Boars.
Sows.
Pigs not above 8 months old.

POULTRY.

To be shown in Pens of One Cock or Cockerel and Two Hens or Pullets of each of the following breeds, except in the sections for Hens and Pullets of the Game and Malay Breeds, where only one bird is required:—

Dorking—Silver-Grey.
Dorking—Coloured.
Cochin-China.
Brahmapootra.
Spanish.
Scotch Grey.
Hamburg—Pencilled.
Hamburg—Spangled.
Polish.
Game—Black or Brown Reds.
Game—Duckwings, or any other variety.
Bantams—Game.
Bantams—Sebright.
Bantams—Any other variety.
Any other pure Breed of Poultry
Ducks—White Aylesbury.
Ducks—Rouen.
Ducks—Any other pure Breed.
Turkeys—Black Norfolk.
Turkeys—Any other Breed.
Geese—Grey Toulouse.
Geese—Embden.
Geese—Any other pure Breed.

F. N. MENZIES, *Secretary.*

3 GEORGE IV. BRIDGE, EDINBURGH,
10*th February* 1876.

LIST OF MEMBERS

OF THE

HIGHLAND AND AGRICULTURAL SOCIETY

ADMITTED SINCE THE LIST WAS PUBLISHED IN MARCH 1875.

16TH JUNE 1875.

Addie, John, Viewpark, Uddingston.
Agnew, William, Balwherrie, Stranraer.
Aikenhead, Alex., Shaw Moss, Pollockshaws.
Ainslie, William, Stobo Mill, Stobo.
Alexander, James (of Jas. Henderson & Co., Coachbuilders), 60, 62, and 64 North Street, Glasgow.
Allan, James, jun., Borrowsto'ness.
Allan, Robert, Clauchlands, Lamlash.
Anderson, Charles, Fettyhill, Leslie, Fife.
Andrews, John, land steward, Melville, Ladybank.
Armstrong, Thos., 175 Craighall Road, Glasgow.

Bain, Samuel F., Inch of Leckie, Gargunnock, Stirling.
Baird, Hugh, jun., 17 Westbourne Gardens, Glasgow.
Baptie, Wm. A., Innishewan, Killin.
Barr, William, Kerrylamont, Rothesay.
Bartlemore, Robt., Nether Houses, Lochwinnoch.
Bayley, George, of Manuel, 13 Regent Terrace, Edinburgh.
Black, Gavin, coalmaster, Easter Moffat, Airdrie.
Black, John, coalmaster, Airdrie.
Blackwood, Alex., Eshiels, Peebles.
Borland, Archd., Stewarton Street, Wishaw.
Brackenridge, Alex., V.S., Stevenston Mains, Holytown.
Brandford, William Catton, Professor of Veterinary Medicine and Surgery, Veterinary College, Edinburgh.
Brown, Thos., Pentland Mains, Loanhead.
Brownlie, James, Holehouseburn, Whitburn.
Brownlie, Thomas, 182 Hope Street, Glasgow.
Bruce, Hen., of Ederline, Lochgilphead.
BRUCE, The Hon. Robert Preston, Broomhall, Dunfermline
Bruce, William L., Glenkill, Lamlash.
Buchanan, William, 391 Parliamentary Road, Glasgow.
Bulloch, Matthew, 11 Park Circus, Glasgow.
Burr, Alex., Tulloford, Tarves.

Campbell, Captain Duncan, yr. of Inverniel and Ross, Ardrishaig.
Campbell, James, Fairyknowe, Ecclefechan.
Campbell, Jn. R. Inveruglas, Arrochar.
CHESHAM, The Right Hon. Lord, Latimer, Chesham, Bucks.
Clerkson, Alex., Lyden, Kirknewton.
Coubrough, Arch., High Craigton, Milngavie.
Cowan, Daniel, 228 Dobbie's Loan, Glasgow.
Cowan, Jn., Church Hill House, Paisley.
Craig, H. V. Gibson, W.S., Edinburgh.
Craig, William, implement maker, Old Meldrum.
Crawford, Robert, of Lochsannish, Campbeltown.
Crawford, Wm., Acholter, Rothesay.
Crawford, Wm., Hillhead, Carnwath.
Cruickshank, John, Longcrook, Craigellachie.

Dalgleish, George, Rosebery Mains, Temple.
Dangerfield, Edw., Balboughty, Perth.
Dent, Irvine, Ravensnook, Penicuik.
Dick, John, ironfounder, Willow Park, Airdrie.
Douglas, Mrs, Green, Kilmalcolm.
Douglas, Archibald, 228 Dobbie's Loan, Glasgow.
Duff, James, factor, Blackwood, Lesmahagow.

Duncan, Alexander, Birgidale, Knock, Rothesay.
Duncan, Alexander R., yr. of Parkhill, factor to Sir William Edmonstone, Gavell House, Kilsyth.
Duncan, Charles, Upper Scoulag, Bute.
Duncan, David, cattle salesman, Glasgow.
Duncan, James, Rhubodach, Rothesay.
Dunlop, Quintin, Morriston, Maybole.
Dykes, Robert, Laigh Hillhouse, Troon.

Edmonstone, Mrs, of Buness, Lerwick.
Elgin and Kincardine, The Right Hon. the Earl of, Broomhall, Dunfermline.
Ellesmere, Right Hon. the Earl of, Worsley Hall, Manchester.
Elliot, James T. S., yr. of Wolfelee, Hawick.
Ewart, Henry, Tynninghame, Prestonkirk.

Ferguson, John, banker, Carnwath.
Ferguson, Peter, Renfrew.
Fleming, John, Woodside, Rutherglen.
Fletcher, John, Bangour, Uphall.
Foulds, A. R., of Clerkland, Stewarton.
Frew, Robert, Sinclairtown, Kirkcaldy.
Fyfe, Wm., Newton of Glamis, Glamis.

Gemmell, Andrew, Caplaw, Neilston.
Gemmell, Gilbert, Upper Whitehaugh, Muirkirk.
Gemmell, John, Garpel, Muirkirk.
Gibson, Francis, Woolmet, Dalkeith.
Gibson, Robert, Ancheneden, Strathblane.
Gilchrist, William, Knivocklaw, Loudoun, Ayrshire.
Gillespie, James, farm manager to the Duchess Dowager of Athole, St Colms, Ballinluig.
Gillespie, James John, Parkhall, Douglas.
Gilmour, James, Orchardton. Cumnock.
Gordon, Graham, 11 Leinster Gardens, Bayswater, London.
Gordon, Joseph C., of Drimnin, Morven, Argyllshire.
Grant, Duncan J., Dandaleith, Craigellachie.
Gregory, John, implement maker, Westoe, South Shields.

Haig, J. W., of Dollarfield, Dollar.
Hall, James M., of Tangy and Killean, Tayinloan.
Hamilton, Gavin, of Auldtown, Lesmahagow.
Hamilton, John, Wellwood, Muirkirk.
Hardie, Edmond W., Locherhouse, Bridge of Weir.
Hay, Alexander, Gifford Vale, Gifford.
Hood, Robert, M.D., of Sunnyside, 5 Salisbury Road, Edinburgh.
Hunter, John, Nethershiel, Mid-Calder.
Hutchison, Thomas, Bellfield, Duddingston, Edinburgh.

Jamieson, Wm., of Shandon, Helensburgh.

Kay, Charles, Mill Farm, Gargunnock, Stirling.
Kerr, John, Elizafield, Dumfries.
Kerr, John G., Illieston, Broxburn,
Kerr, William, Newhouse, Dalry.
Kidston, Richd., 81 Great Clyde Street, Glasgow.
Kippen, Durham, of Busby, Glasgow.
Kirkpatrick, David, Linns, Torthorwald.

Lang, Alex., Garneyland, Paisley.
Leithead, James, The Bow, Stow.
Lennox, Charles, Carntyne Chemical Work, Parkhead.
Lightfoot, Henry le Blanc, Ardgowan, Greenock.
Linn, Wm., Chevington, Woodside, Acklington.
Lloyd, Thomas, of Minard Castle, Inveraray.
Love, Alex., Margaret's Mill, Kilmalcolm.
Lumsden, James, Arden House, Alexandria, N.B.

M'Camon, John, Kirranrae, Stranraer.
M'Connell, John A., Chapelheron, Whithorn.
M'Diarmid, Duncan, Glengoulandie, Aberfeldy.
Macdonald, C. Moreton, of Largie, Campbeltown.
M'Donald, Jn., of Newton, Lochmaddy.
M'Dougal, Thomas, Eskvale, Penicuik.
M'Dowal, Henry, yr. of Garthland, Lochwinnoch.
M'Intyre, Daniel, Dunallan, Rothesay.
M'Kay, John, Home Farm, Portree.
M'Kie, And., Corrahill, Kirkcudbright.
M'Lachlan, Colin. Drums, Greenock.
Maclean, Arch. John, of Pennycross, Auchnacraig, Mull.
MacLean, Charles, Milton, South Uist, Lochmaddy.
M'Leod, F. H., 30 Ann St., Glasgow.
M'Min, Thomas McC., Upper Wellwood, Muirkirk.
Macphail, Donald, Oskamul, Aros, Mull.

M'Pherson, Donald, Lettermore, Aros, Mull.
Maddison, Henry, The Linden, Darlington.
Maitland, Robert, Balhalgardy, Invernrie.
Martin, John, Ardnahoe, Rothesay.
Mather, Edward, engineer and millwright, 63 Fountainbridge, Edinr.
Maxwell, William Hall, of Dargavel, Bishopton.
Meek, John, flesher, Whitburn.
Menzies, Fergus, Blackhall, Dunfermline.
Merson, James, Craigwillie, Huntly.
Milroy, James, Galdenoch, Stoneykirk, Stranraer.
Mitchell, John, Cairn, Mearns.
Morison, James Walker, of Falfield, Cupar-Fife.
Morton, John, Nether Abington, Abington.
Muirhead, Thomas, North Crookedstone, Hamilton.
Muirhead, Wm., Auchinairn, Bishopbriggs.
Murdoch, Alex., Gartcraig, Shettleston, Glasgow.
Murdoch, James, jun., Carntyne, Parkhead, Glasgow.
Murdoch, John, Hilton, Bishopbriggs.
Mutter, John, 29 Chalmers Street, Edinburgh.

Napier, J. S., of Lethawe, Strathavon.

Ord, John Robert, of Haughton Hall, Darlington.
Orr, James, of Harvieston, Dollar.

Pagan, G. H., banker, Cupar-Fife.

Rankine, Patrick, M.D., Willow Bank, Airdrie.
Robertson, Andrew, Grougfoot, Linlithgow.
Ross, Lachlan, Royal Hotel, Portree.
Russell, James, National Bank of Scotland, Airdrie.

Sandeman, Alex. B., Huntingtower Field, Perth.
Sanderson, James, Dykefoot, Carnwath.
Scott, Alex., Cauldcoats, Liberton.
Scott, Robert Sinclair, Craigievar, Wemyss Bay.
Scott, William, Condorratt, Airdrie.
Sheriff, G., jun., Queen's Hotel, Glasgow.
Simpson, John, South Colmac, Rothesay.
Smith, Charles, 36 Howard Street, Glasgow.
Spencer, Andrew (Shaws, Dalserf), 160 Hope Street, Glasgow.
Stark, Matthew C., Manse, Gargunnock.
Swann, John Vincent Russell, Commissioner of Deeds, Engineer's Office, Moscow, Russia.

Tait, George, jun., V.S., Elgin.
Thom, Jas. Flockhart, Wellsgreen, East Wemyss, Dysart.
Thomson, John, Prospect Bank, Cathcart.
Thomson, Thomas, Bankhead, Alloa.
Thomson, William G. (Messrs John Thomson & Sons), 49 Hope Street, Glasgow.
Troup, Alexander, Strathmiglo.
Tulloch, John, Midmains, Duffus, Elgin.
Turner, Archd., jun., Drimdrishaig, Ardrishaig.

Ure, George, Wheatlands, Denny.
Ure, George R., Hope Park, Denny.

Walker, John, Lochton, Inchture.
Walker, Robert Bartlett, Mains of Portlethen, Aberdeen.
Wallace, John, 30 Oak Street, Glasgow.
Wallace, Robert, Auchenbrain, Mauchline.
Wallace, William, Kinnear, Kilmany, Cupar-Fife.
Watson, Hugh, Gallin Cottage, Aberfeldy.
Watt, Robert, solicitor, Airdrie.
Waugh, John, jun., Glenormiston, Innerleithen.
Weir, John, grain merchant, Coatbridge.
Williamson, Robert, Netherwood, Banff.
Wilson, John, Lecropt, Bridge of Allan.
Wood, James, Riddrie, Parkhead.
Wylie, Alex., W.S., 13 Picardy Place, Edinburgh.

19TH JANUARY 1876.

Aitken, James, of Auchengillan, Strathblane.

Baird, Colin C., V.S., Veterinary College, Clyde Street, Edinburgh.
Baird, James, Crosshill, Rutherglen.
Bell, John, Merryhillock, Fraserburgh.
Benton, William, Crookmore, Alford.
Black, John, The Mains, Haddo House, Aberdeen.
Blackburn, James Killearn, House, Glasgow.

Blake, John, Dunrobin Mains, Golspie.
Bower, Alfred Lance, Straithaird House, Broadford.
Brebner, Robert, Lumbs, Lonmay, Aberdeenshire.
Brock, James E., Overton, Kirkliston.
Brown, John, Morvich, Kintail.
Brown, John, Colton, Dunfermline.
Bruce, Peter, Myreton, Insch, Aberdeen.
Buchanan, Capt. Jas. R. Gray, of Scotstone, Eastfield House, Cambuslang.
Buchanan, Robert, Blairquhosh, Strathblane.
Buyers, J., jun., Easter Brakie, Arbroath.

Cameron, J. C., of Garrows, Amulree.
Campbell, Sir Arch. S. L., of Succoth, Bart., Garscube.
Carre, Thos. A. Riddell, of Cavers Carre, St Boswells.
Cavens, Thos., Birkshaw, Glencairn, Dunscore, Dumfries.
Charlton, John, Dumfries.
Christie, James, Sunnyside, Prestonkirk.
Clerk, Sir George Douglas, of Penicuik, Bart.
Colquhoun, Major James, Arrochar House, Arrochar.
Cullen, Archibald, Woodend, Airdrie.

Dalhousie, Right Hon. the Earl of, Dalhousie Castle, Bonnyrigg.
Dixon, William S., Belleisle, Ayr.
Dunlop, Colin Robert, of Quarter, Hamilton, 191 West George Street, Glasgow.
Dundas, Charles Henry, Dunira, Crieff.
Dunn, John, corn merchant, Kelso.

Fleming, J. B., Beaconsfield, Kelvinside, Glasgow.
Forbes, Alexander, Pitfourie, Pitlochry.
Forbes, Arthur Edward Whitmore, Wentworth Woodhouse, Rotherham.
Forrester, Robert, of Carbeth, Killearn.

Gladstone, John Robert, yr. of Fasque.
Gordon, Charles, of Halmyre, Lamancha.
Grant, George Smith, Auchorachan, Glenlivet.
Gray, John, 15 Exchange Square, Glasgow.
Greenshields, Thomas A., Stonehill, Crawfordjohn.

Hannay, R., of Hanley, Corstorphine.
Harper, Robert S., Edmonstone Mains, Liberton.
Henderson, A. G., Greenside Copper Works, Greenside Row, Edinburgh.
Herdman, Benjamin A., Falkland Wood, Falkland.
Hogg, Robert, 92 Gilmore Place, Edin.
Howatson, M. S., Cronberry, Cumnock.
Hunter, Capt. Alex. Chalmers, of Tillery and Auchiries, Aberdeen.
Hunter, James, of Antonshill, Coldstream.
Hunter, John, Confunderland, Leochel-Cushnie.
Hurll, John, Cardowan Brickworks, Moodiesburn.

Jamieson, George, Lord Provost of Aberdeen.
Jamieson, William F., solicitor, Anstruther.
Johnston, James, Pather Farm, Wishaw.

Kemp, Charles, Recletich, Glenrinnes, Dufftown.
Kilgour, Robert, jun., Ardlin, Ellon.
Kirkpatrick, James, Redhills, Torthorwald, Dumfries.

Lawson, A. B., Clynelish, Brora.
Littlejohn, Wm., Whitemyers, Old Skene Road, Aberdeen.
Logan, John Walker (Messrs Logan & Elder), Berwick-on-Tweed.

MacGillivray, Dr Donald Wm., Eoligary, Barra, Lochmaddy.
MacGillivray, Wm., Eoligary, Barra, Lochmaddy.
MacGoune, John G., Mains, Alexandria.
MacKerrow, M. S., Boreland of Southwick, Dumfries.
Mackinnon, Colin Macrae, Ardrishaig.
Mackinnon, William, of Loup, Clachan, Kintyre.
Maclae, Alex. Crum, of Cathkin, Carmunnock.
M'Laurin, Dougald, Dalbeattie.
M'Nair, Robert, Westerton, New Kilpatrick.
M'Nicol, John, Salachael, Fasnacloich. Fort-William.
M'Phail, Donald, Cameron, Mull.
M'Phail, Donald, Laggan, Mull.
M'Phail, Dugald, Barachendramum, Lochbuy, Mull.
Macpherson, Donald, Argyll Arms Hotel, Inveraray.
Macpherson, John, Achlochrach, Glenrinnes, Dufftown.
M'Taggart, John, Culnaightry, Auchencairn, Castle-Douglas.
Malcolm, William, Carsaig, Mull.
Mather, William, Muirhead Cottage, Moodiesburn.

Meikle, James, Lugtonridge, Beith.
Menzies, Alex., grain merchant, Airdrie.
Milroy, John, Balgreggan Mains, Stranraer.
Mitchell, Wm, Meikle Dens, Longside.
Moir, Peter, Her Majesty's Horse Repository, Nottingham Place, Edin.
Moir, William, Her Majesty's Horse Repository, Nottingham Place, Edin.
Montrose, His Grace the Duke of, Buchanan Castle, Drymen.
More, John, Fordhead, Gargunnock.
Morrison, Thomas (Messrs Somerville & Morrison), 34 Hutcheson St., Glasgow.
Mortimer, William, Old Keig, Keig.
Muirhead. William, Meikle Richorn, Dalbeattie.
Mundell, James, Corrimony, Drumnadrochet.

Paterson, George, Glentaggart, Douglas.
Picken, Thomas, Barsalloch, Portwilliam.
Pringle, James, brewer, 1 Bellevue Place, Edinburgh.

Ramsay, the Right Hon. Lord, Dalhousie Castle, Bonnyrigg.
Ramsay, Alex., editor *Banffshire Journal*, Banff.
Rankine, Alex., yr. of Beoch, Lochlands, Maybole.
Reid, Donald, Donavourd, Pitlochry.
Robertson, Duncan, advocate, yr. of Pennyghael, 73 Great King Street, Edinburgh.
Robertson, George, of Hedderwick, C.E., 47 Albany Street, Edinburgh.
Robertson, Major James Carmichael, Whitefield, Govan.
Robertson, J., Auchnahoyle, Pitlochry.
Robertson, James Stewart, yr. of Edradynate, Ballinluig.
Robertson, Robert William, of Glenshellish, Argyllshire, Rockingham, Kilcreggan.

Scott, Alex., Towie Barclay, Aberdeen.
Scott, Thomas, iron merchant, Grassmarket, Edinburgh.
Smith, the Rev. William, D.D., North Leith.
Steuart, H. T. Gow, Fowler's Park, Hawkhurst, Kent.
Stewart, William, Achlatt, Pitlochry.
Symington, James, auctioneer, Lanark.

Tait, John, Crichie, Inverurie.
Taylor, Hugh, Kaimshill, Hurlford, Kilmarnock.
Tennant, Thomas, Walston, Penicuik.
Tennant, Wm. John, Gallin Cottage, Aberfeldy.
Thomson, William, gunmaker, Princes Street, Edinburgh.
Todd, David (Messrs Murray & Todd), cattle agent, Edinburgh.

White, Duncan, sheep and cattle salesman, 326 Duke Street, Glasgow.
White, James, Stagehall, Stow.
White, Robert, brewer, 3 Abercromby Place, Edinburgh.
Whyte, Duncan Clark, Ballimore, Lochstrivenhead, Sandbank.
Wilson, George, Whiteside, Tullynessle, Aberdeen.
Wilson, John, of Finnich Malise, Drymen.
Wordsworth, Robert Walter, Gartmore, Stirling.

Young, Jas., yr. of Kelly, Wemyss Bay.
Young, John, Hailes Cottage, Slateford.
Young, William Stirling, Keir Mains, Dunblane.

Diploma-Holders—Elected Free Life Members, 16th June 1875.

Beck, Thomas Coker, Foleshill, Coventry.
Kennedy, William, 89 Marine Parade, Brighton.
Murdoch, Geo. Burn, Greenhill Lodge. Edinburgh.
Murray, Robert W. E., Wester Housebyres, Galashiels.

Number of Members in list published March 1875, . . .	4430
Number of Members admitted in June 1875, ...	186
Number of Members admitted in January 1876, . . .	124
Number of Holders of Agricultural Diploma admitted Free Life Members in June 1875, ...	4
	4744
Deduct estimated Deaths, &c., ...	144
Total, .	4600

F. N. MENZIES, *Secretary.*

Edinburgh, *March* 1876.

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